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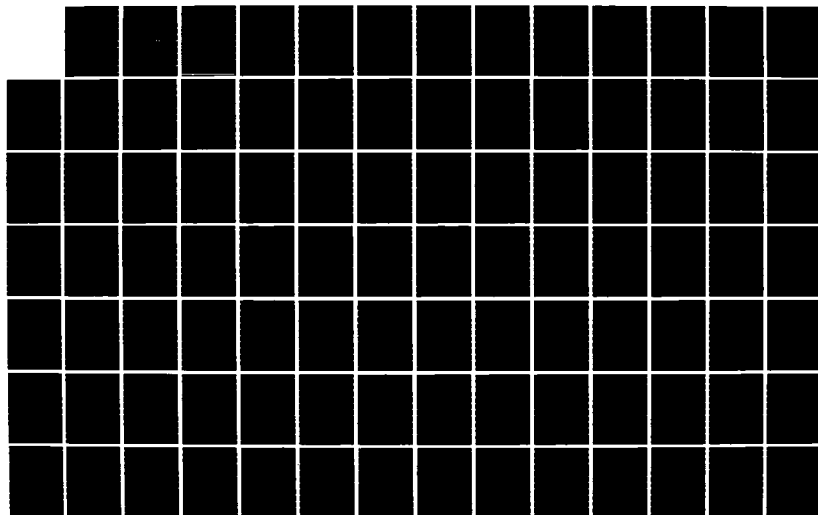
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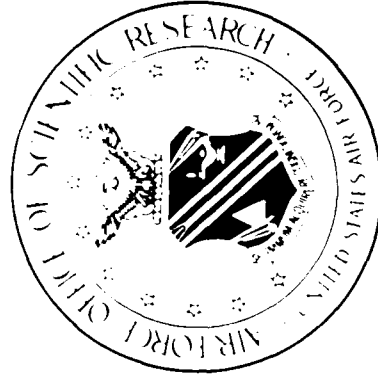
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# AIR FORCE OFFICE OF SCIENTIFIC RESEARCH

Air Force Systems Command

AFOSR

TECHNICAL REPORT SUMMARIES



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**TECHNICAL REPORT SUMMARIES**

**FIRST QUARTER 1986**

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# SUBJECT INDEX

## UNCLASSIFIED

## SUBJECT INDEX

- \*ABSORPTION  
Semiconductors Investigated by  
Picosecond Absorption, Fluorescence  
and Raman Time-Resolved  
Spectroscopy.\*  
AD-A182 303
- \*ABSORPTION SPECTRA  
Reprint: Possibility of  
Observing Quantum Size Effects in  
the Electromagnetic Absorption  
Spectrum of Small Metal Particles.  
AD-A181 182
- \*ACETYLENE  
Reprint: (13)C and (1)H Hyperfine  
Tensors for Polyacetylene Analyzed  
in Terms of Pi (-o) Electron  
Coulombic Interactions.  
AD-A182 895
- \*ACETYLENES  
Reprint: Electron Nuclear Double  
Resonance Spectra of Cis-Rich and  
Trans-Rich Polyacetylenes between  
1.9 and 4.2 K.  
AD-A182 816
- \*ACQUISITION  
Spread Spectrum Acquisition and  
Tracking.\*  
AD-A182 442
- \*ADAMANTANES  
Reprint: Adamantylidimethylsilyl  
Ethers.  
AD-A182 073
- \*ADAPTIVE CONTROL SYSTEMS  
Robust Adaptive Control.\*  
AD-A181 349  
Reprint: Dual Control and  
Prevention of the Turn-off  
Phenomenon in a Class of MIMO  
Systems.  
AD-A181 589  
Reprint: New Directions in  
Parameter Adaptive Control.  
AD-A181 713  
Reprint: A Smooth Algorithm for  
Adaptive Stabilization of a
- Discrete Linear System with an  
Unknown High Frequency Gain.  
AD-A182 247  
Adaptive Control of  
Multivariable Systems.\*  
AD-A182 795  
A 4(n+1)-Dimensional Model  
Reference Adaptive Control for the  
Stabilization of any Strictly  
Proper Minimum Phase Linear Systems  
with Relative Degree Not Exceeding  
Two and Dimension Not Exceeding n.\*  
AD-A182 808  
Reprint: Adaptive Stabilization  
of Linear Systems with Unknown High-  
Frequency Gains.  
AD-A182 921
- \*ADSORBATES  
Reprint: Vibrational Energy  
Relaxation of Adsorbates on  
Surfaces.  
AD-A182 804
- \*ADSORPTION  
Reprint: vibrationally Excited  
CO<sub>2</sub> from the Reaction of O Atoms  
and Adsorbed CO on Platinum.  
AD-A181 219  
Reprint: Adsorption and  
Desorption of NO from Rh(111) and  
Rh(331) Surfaces.  
AD-A182 831
- \*AEROELASTICITY  
Stochastic Non-Linear Flutter of  
Aeroelastic Structures.\*  
AD-A182 748
- \*AERTHERMODYNAMICS  
Reprint: Terminal Distributions  
of Rotational Energy in Free Jets  
of CO and CO<sub>2</sub>.  
AD-A181 315  
Research on Aero-Thermodynamic  
Distortion Induced Structural  
Dynamic Response of Multi-Stage  
Compressor Blading.\*  
AD-A182 432
- \*AFTERGLOWS
- Reprint: Nascent Product-  
Vibrational State Distributions of  
Thermal Ion-Molecule Reactions  
Determined by Infrared  
Chemiluminescence.  
AD-A182 693
- \*AIR FORCE RESEARCH  
United States Air Force Weapons  
Laboratory Research Scholar  
Program, 1983-1984.\*  
AD-A181 246  
AFOSR (Air Force Office of  
Scientific Research) Technical  
Report Summaries.\*  
AD-A182 372  
Final Report on Air Force  
Research Grant AFOSR-84-0059.\*  
AD-A182 827
- \*AIRFRAMES  
Stochastic Non-Linear Flutter of  
Aeroelastic Structures.\*  
AD-A182 748
- \*AIRGLOW  
Reprint: Ground-Based  
Atmospheric Infrared and Visible  
Emission Measurements.  
AD-A182 930
- \*ALGORITHMS  
On an Estimate for the Three-  
Grid MGR Multigrid Method.\*  
AD-A181 096  
Finding Test-and-Treatment  
Procedures Using Parallel  
Computation.\*  
AD-A182 141  
Asymptotic Behavior of  
Constrained Stochastic  
Approximations via the Theory of  
Large Deviations.\*  
AD-A182 156  
Numerical Algorithms & Parallel  
Tasking.\*  
AD-A182 221  
The Reduction of Perturbed  
Markov Generators: An Algorithm  
Exposing the Role of Transient  
States.\*

SUBJECT INDEX-1  
UNCLASSIFIED EVK551



# UNCLASSIFIED

- AD-A162 773  
Updating Properties of Directed  
Acyclic Graphs on a Parallel Random  
Access Machine.\*  
AD-A162 954
- \*ALKALINE EARTH OXIDES  
Re-Evaluation of Surface  
Properties of Oxide-Cathode  
Materials.\*  
AD-A161 131
- \*ALLOYS  
Clustering and Ordering in III-V  
Alloys.\*  
AD-A161 099  
Study of Crack Front  
Distribution During Crack  
Propagation Stage in High  
Performance Alloys.\*  
AD-A162 742
- \*ALUMINUM COMPOUNDS  
Reprint: Electrochemical Studies  
of Iodine in an Aluminum Chloride-  
Butylpyridinium Chloride Ionic  
Liquid. Part 2. Neutral and Basic  
Solvent Composition.  
AD-A162 075  
Reprint: Electrochemical  
Reduction of N-(1-Butyl)pyridinium  
Cation in 1-Methyl-3-  
Ethylimidazolium Chloride-Aluminum  
Chloride Ambient Temperature Ionic  
Liquids.  
AD-A162 078
- \*AMINO ACIDS  
Development and Use of  
Anucleated Bacterial Cells to Assay  
the in vivo Activity of  
Pollutants.\*  
AD-A162 727
- \*AMMONIA  
Reprint: Surface Bonding of the  
NH<sub>3</sub> and NH<sub>2</sub> Species to Ni(110).  
AD-A162 270
- \*ANALYSIS OF VARIANCE  
Reprint: A Note on Levene's  
Tests for Equality of Variances.  
AD-A161 377  
Effect of Additional Variables  
in Principal Component Analysis.  
Discriminant Analysis and Canonical  
Correlation Analysis.\*  
AD-A162 069
- \*ANALYTICAL CHEMISTRY  
Reprint: Carbene and Silicon  
Routes Toward a Simple Nitrile  
Ylide. Spectroscopic, Kinetic, and  
Chemical Characterization.  
AD-A162 928
- \*ANGULAR MOMENTUM  
Reprint: Monte Carlo Transition-  
State Study of Angular Momentum  
Effects on the Unimolecular  
Dissociation of CH<sub>4</sub> on the  
Duchovic-Hase-Schegel ab Initio  
Surface.  
AD-A162 218
- \*ANHARMONIC OSCILLATORS  
Reprint: Quantum Statistical  
Theory of Vibrational Dynamics in a  
Laser-Driven Admolecule-Surface  
System.  
AD-A163 058
- \*ANIONS  
Reprint: Can Desolvation of an  
Ion Be the Rate-Determining Step in  
a Reaction?  
AD-A162 297  
Reprint: Factors Influencing the  
Magnitude of Alpha-13C Hyperfine  
Couplings in Cyclosilane Anion  
Radicals.  
AD-A162 906  
Reprint: ESR (Electron Spin  
Resonance) Spectra for Anion  
Radicals of Alkylcyclopentasilanes  
and Cyclopentasilanes.  
AD-A162 919
- \*ANTENNA RADIATION PATTERNS  
The Interaction and Variation of  
Waves and Turbulence from MST Radar  
Data.\*
- AD-A162 983
- \*APPROXIMATION(MATHEMATICS)  
A Birth and Death Process  
Approximation for the Slotted ALOHA  
Algorithm.\*  
AD-A162 153  
Asymptotic Behavior of  
Constrained Stochastic  
Approximations via the Theory of  
Large Deviations.\*  
AD-A162 156  
On a Joint Strong Approximation  
Theorem for Record and Inter-Record  
Times.\*  
AD-A162 888
- \*ARRAYS  
Electromagnetic Sensor Arrays  
for Nondestructive Evaluation and  
Robot Control.\*  
AD-A161 292
- \*ARTIFICIAL INTELLIGENCE  
Knowledge Representation and  
Natural-Language Semantics.\*  
AD-A162 389
- \*ASSOCIATIVE PROCESSING  
Associative Networks on a  
Massively Parallel Computer.\*  
AD-A162 234
- \*ASYMPTOTIC NORMALITY  
M-Estimation for Discrete Data.  
Asymptotic Distribution Theory and  
Implications.\*  
AD-A162 779
- \*ASYMPTOTIC SERIES  
Asymptotic Global Behavior for  
Stochastic Approximations and  
Diffusions with Slowly Decreasing  
Noise Effects: Global Minimization  
via Monte Carlo.\*  
AD-A162 333
- \*ATMOSPHERIC ELECTRICITY  
Earthquake Light.\*  
AD-A161 385

SUBJECT INDEX-2  
UNCLASSIFIED EVK551

ALK-ATM

UNCLASSIFIED

- \*ATMOSPHERIC MOTION  
The Turbulent Gravity Wave-Critical Level Encounter in the Evolution of Atmospheric Flow.\*  
AD-A162 335  
Reprint: Evidence for Coexisting Spectra of Stratified Turbulence and Internal Waves in Mesoscale Atmospheric Velocity Fields.  
AD-A162 840
- \*ATMOSPHERIC PHYSICS  
Measurement of Atmospheric Transmission Over Long Paths in the Infrared Spectral Region.\*  
AD-A161 258  
Reprint: Transverse Ageostrophic Circulations Associated with Elevated Mixed Layers.  
AD-A163 063
- \*ATMOSPHERIC PRECIPITATION  
Effects of Mountain Ranges on Mesoscale Systems Development.\*  
AD-A161 136
- \*ATOMIC PROPERTIES  
Reprint: Spontaneous Emission by Two Atoms with Different Resonance Frequencies near Metal Surface.  
AD-A161 123
- \*ATOMIC SPECTROSCOPY  
Atomic and Molecular Gas Phase Spectrometry.\*  
AD-A162 339
- \*AUGER ELECTRON SPECTROSCOPY  
Reprint: Neutralization and Excitation in Low-Energy Ion-Surface Collisions.  
AD-A163 011
- \*AURORAE  
Reprint: Rocket-Borne Measurements of Atmospheric Infrared Fluxes.  
AD-A162 819
- \*AUTOMATIC PROGRAMMING  
Reprint: Automatic Programming:  
A Tutorial on Formal Methodologies.  
AD-A162 207
- \*BACTERIA  
Development and Use of Anucleated Bacterial Cells to Assay the in vivo Activity of Pollutants.\*  
AD-A162 727
- \*BENZONITRILES  
Reprint: The Dynamics of Barrier Crossings in Solution: The Effect of a Solvent Polarity-Dependent Barrier.  
AD-A162 892
- \*BENZYL RADICALS  
Reprint: The Observation of CIDEP (Chemically Induced Dynamic Electron Polarization) from the Photodecomposition of Dibenzy Ketone in Micellar Solution.  
AD-A161 660
- \*BIFURCATION(MATHEMATICS)  
Nonlinear Dynamics and Chaotic Motions in Feedback Controlled Elastic Systems.\*  
AD-A162 385
- \*BORON CARBIDES  
Development of Spacecraft Materials and Structures Fundamentals.\*  
AD-A161 338
- \*BOUNDARY LAYER FLOW  
Numerical Simulation of Unsteady Three-Dimensional Turbulent Structures in Boundary Layer Flows.\*  
AD-A162 130
- \*BOUNDARY VALUE PROBLEMS  
Reprint: Convenient Stability Criteria for Difference Approximations of Hyperbolic Initial-Boundary Value Problems.  
AD-A162 264
- \*BROMINE  
Reprint: The A' 3P(2 sub u)-X 1 Sigma ( ) sub g Emission Spectrum of Br2 in an Argon Matrix.  
AD-A163 111
- \*BUBBLE MEMORIES  
A Program of Research on Microfabrication Techniques for VLSI Magnetic Devices.\*  
AD-A161 271
- \*BUCKLING  
Delamination Buckling and Growth of Flat Composite Structural Elements.\*  
AD-A162 370  
Buckling of Delaminated Shells and Multi-Annular Plates.\*  
AD-A162 371
- \*BULK SEMICONDUCTORS  
Analytical Investigations of Bulk Wave Resonators in the piezoelectric Thin Film on Gallium-Arsenide Configuration.\*  
AD-A162 088
- \*CADMIUM TELLURIDES  
Nonlinear Optical Phenomena in Solids.\*  
AD-A162 384
- \*CARBON ALLOYS  
Ordered Carbon - Metal Alloys for Extraterrestrial Power Systems.\*  
AD-A162 287
- \*CARBON DIOXIDE  
Reprint: Time-Resolved Infrared Emission Studies of CO(2) Formed by CO Oxidation on Pt and Pd.  
AD-A161 166  
Reprint: Distribution of Internal Energy in CO and CO2 Vibrationally Excited by a Hot Platinum Surface.  
AD-A161 224  
Reprint: Terminal Distributions of Rotational Energy in Free Jets

SUBJECT INDEX-3  
UNCLASSIFIED EVK551

ATM-CAR

# UNCLASSIFIED

of CO and CO2.  
AD-A161 315

## \*CARBON MONOXIDE

Reprint: Distribution of  
Internal Energy in CO and CO2  
Vibrationally Excited by a Hot  
Platinum Surface.  
AD-A161 224

Reprint: State-Specific Rates of  
H2CO(SO) Yields H2 at Energies  
Near the Top of Barrier: A  
violation of RRKM Theory.  
AD-A161 229

## \*CARBONYL COMPOUNDS

Reprint: Electrochemical  
Oxidation of Some Metal Carbonyls  
in Ambient Temperature Ionic  
Liquids.  
AD-A161 188

## \*CATALYSIS

Reprint: Zinc Iodide Catalyzed  
Reaction of Oxetanes with  
Trimethylsilyl Cyanide.  
AD-A163 064

## \*CATHODES

Re-Evaluation of Surface  
Properties of Oxide-Cathode  
Materials.\*  
AD-A161 131

## \*CATIONS

Reprint: Velocity Dependence of  
Azimuthal Anisotropies in Ion  
Scattering from Rhodium (111).  
AD-A162 872

## \*CELLS

Variable Band Gap Materials for  
Thermophotovoltaic Generators.\*  
AD-A161 987

## \*CELLS(BIOLOGY)

Development and Use of  
Anucleated Bacterial Cells to Assay  
the in vivo Activity of  
Pollutants.\*  
AD-A162 727

## \*CERAMIC MATERIALS

A New Process for Final  
Densification of Ceramics.\*  
AD-B096 961L

## \*CHARGE TRANSFER

Reprint: Product Vibrational  
State Distributions of Thermal  
Energy Charge Transfer Reactions  
Determined by Laser-Induced  
Fluorescence in a Flowing  
Afterglow: Ar( ) CO Yields CO( )(V=0-  
6) Ar.  
AD-A162 985

## \*CHEMICAL BONDS

Reprint: Electronic Structure of  
the Phosphoryl and Thiophosphoryl  
Bonds.  
AD-A162 809

## \*CHEMICAL DISSOCIATION

Reprint: Monte Carlo Transition-  
State Study of Angular Momentum  
Effects on the Unimolecular  
Dissociation of CH(4) on the  
Duchovic-Hase-Schegel ab initio  
Surface.  
AD-A162 218

## \*CHEMICAL RADICALS

Laser-Induced Kinetics: An  
Experimental and Theoretical  
Program.\*  
AD-A161 994

Reprint: MNDO Study of Ring  
Opening in the Succinimidy  
Radical.  
AD-A162 150

Reprint: ESR (Electron Spin  
Resonance) Spectra for Anion  
Radicals of Alkylcyclooctasilanes  
and Cyclopentasilanes.  
AD-A162 919

## \*CHEMICAL REACTIONS

Development of Practical MO  
techniques for the Prediction of  
the Properties and Behavior of  
Materials.\*  
AD-A161 992

Reprint: Can Desolvation of an  
Ion Be the Rate-Determining Step in  
a Reaction?  
AD-A162 297

## Theory and Experiments on

Chemical Instabilities.\*  
AD-A162 430  
Fluctuations Near Homogeneous  
States of Chemical Reactions with  
Diffusion.\*

AD-A162 875  
Titanium Tetrachloride Promoted  
Reactions of Allylic  
Trimethylsilanes and Oxetane.  
AD-A162 951

## \*CHEMILUMINESCENCE

Reprint: Nascent Product-  
Vibrational State Distributions of  
Thermal Ion-Molecule Reactions  
Determined by Infrared  
Chemiluminescence.  
AD-A162 893

## \*CHEMISORPTION

Reprint: Surface Bonding of the  
NH3 and NH2 Species to Ni(110).  
AD-A162 270  
Reprint: Vibrational  
Deactivation of Surface OH  
chemisorbed on SiO sub 2: Solvent  
Effects.  
AD-A162 803

## \*CHLORIDES

Reprint: Electrochemical Studies  
of Iodine in an Aluminum Chloride-  
Butylpyridinium Chloride Ionic  
Liquid. Part 2: Neutral and Basic  
Solvent Composition.  
AD-A162 075

Reprint: Electrochemical  
Reduction of N-(1-Butyl)Pyridinium  
Cation in 1-Methyl-3-  
Ethylimidazolium Chloride-Aluminum  
Chloride Ambient Temperature Ionic  
Liquids.  
AD-A162 078

## \*CHOLINESTERASE INHIBITORS

Reprint: Quantum Theoretical

SUBJECT INDEX-4  
UNCLASSIFIED EVK551

CAR-CHO

# UNCLASSIFIED

Determination of the Molecular Structure of some Anticholinesterase Agents.  
AD-A162 074  
Reprint: The Ab Initio Structure of O-Methyl Methylphosphonofluoridate.  
AD-A162 817

\*CHYMOTRYPSIN  
Reprint: Alternative View of Enzyme Reactions.  
AD-A162 198

\*CLEAR AIR TURBULENCE  
Reprint: Direct Measurement of Large-Scale Vertical Velocities Using Clear-Air Doppler Radars.  
AD-A162 973  
The Interaction and Variation of Waves and Turbulence from MST Radar Data.\*  
AD-A162 983

\*CLOSED LOOP SYSTEMS  
Reprint: Adaptive Stabilization of Linear Systems with Unknown High-Frequency Gains.  
AD-A162 921

\*COMBUSTORS  
Combustor/Inlet Interactions and Modeling of Hypersonic Dual Combustor Ramjet Engines.\*  
AD-A162 111

\*COMPOSITE MATERIALS  
The Reliability of Load Sharing Systems.\*  
AD-A162 121  
A Model for Predicting Thermomechanical Response of Large Space Structures.\*  
AD-A162 140  
Nonlinear Dynamic Response of Composite Rotor Blades.\*  
AD-A162 158  
Analysis of Progressive Matrix Cracking in Composite Laminates.\*  
AD-A162 220  
Analysis and Experiments on

Interlaminar Fracture Toughness in Resin Matrix Composites.\*  
AD-A162 689

\*COMPOSITE STRUCTURES  
A Model for Predicting Thermomechanical Response of Large Space Structures.\*  
AD-A162 140  
Nonlinear Dynamic Response of Composite Rotor Blades.\*  
AD-A162 158  
Reprint: Internal Damping of Short-Fiber Reinforced Polymer Matrix Composites.  
AD-A162 311

\*COMPRESSOR BLADES  
Research on Aero-Thermodynamic Distortion Induced Structural Dynamic Response of Multi-Stage Compressor Blading.\*  
AD-A162 432

\*COMPUTER APPLICATIONS  
Optical Computing Research.\*  
AD-A162 272  
Computer-Aided Engineering.\*  
AD-A162 811

\*COMPUTER ARCHITECTURE  
Reprint: Dynamically Restructurable Fault-Tolerant Processor Network Architectures.  
AD-A161 358  
Reprint: The De Bruijn Multiprocessor Network: A Versatile Sorting Network.  
AD-A161 509

\*COMPUTER PROGRAM RELIABILITY  
Fault Diversity in Software Reliability.\*  
AD-A162 757

\*COMPUTER PROGRAMMING  
Robust Adaptive Control.\*  
AD-A161 349

\*COMPUTER PROGRAMS  
Development of Practical MO

techniques for the Prediction of the Properties and Behavior of Materials.\*  
AD-A161 992

\*COMPUTERIZED SIMULATION  
Spread Spectrum Acquisition and Tracking.\*  
AD-A162 442

\*CONFIDENCE LEVEL  
Effects of Estimated Noise Covariance Matrix in Optimal Signal Detection.\*  
AD-A162 798

\*CONTROL SYSTEMS  
Exploration of the Maximum Entropy/Optimal Projection Approach to Control Design Synthesis for Large Space Structures.\*  
AD-A161 355

\*CONTROL THEORY  
Reprint: New Directions in Parameter Adaptive Control.  
AD-A161 713  
Nearly Optimal State Feedback Controls for Stochastic Systems with Wideband Noise Disturbances.\*  
AD-A162 271  
On a Theory of Control for Linear Systems Over Rings and Nonlinear/Time-Varying Systems.\*  
AD-A162 880

\*CONVECTION(ATMOSPHERIC)  
Effects of Mountain Ranges on Mesoscale Systems Development.\*  
AD-A161 136

\*COPOLYMERS  
Reprint: Organosilane Polymers: Formable Copolymers Containing Diphenylsilylene Units.  
AD-A162 907

\*COUPLING(INTERACTION)  
Reprint: Factors Influencing the Magnitude of Alpha-13C Hyperfine Couplings in Cyclosilane Anion

SUBJECT INDEX-5  
UNCLASSIFIED EVK551

CHY-COU

# UNCLASSIFIED

- Radicals.  
AD-A162 906  
Reprint: Nanosecond Flash  
Photolysis Studies of Intersystem  
Crossing Rate Constants in  
Bridged: Structural Effects  
Brought about by Spin Orbit  
Coupling.  
AD-A162 948
- \*CRACK PROPAGATION  
Initiation, Growth, and  
Coalescence of Small Fatigue  
Cracks.\*  
AD-A161 305  
Nonlinear Fracture Mechanics  
Analysis with the Boundary Integral  
Method.\*  
AD-A162 027  
Study of Crack Front  
Distribution During Crack  
Propagation Stage in High  
Performance Alloys.\*  
AD-A162 742
- \*CRACKS  
Analysis of Progressive Matrix  
Cracking in Composite Laminates.\*  
AD-A162 220
- \*CRYOGENICS  
Fundamental Experiments at  
Liquid Helium Temperatures (Low  
Temperature Studies of Anomalous  
Surface Shielding and Related  
Phenomena). \*  
AD-A162 392
- \*CURVES(GEOMETRY)  
Numerical Generation of 3D  
curvilinear Coordinate Systems and  
Computational Grids for Aircraft  
Configurations.\*  
AD-A162 249
- \*CYANOGEN  
Reprint: Photodissociation  
Dynamics of Nozzle-Cooled ICN.  
AD-A161 859
- \*CYCLIC COMPOUNDS
- Reprint: MNDO Study of Ring  
Opening in the Succinimidy  
Radical.  
AD-A162 150  
Reprint: Natural Abundance (13C  
and (29)Si ENDOR Studies of  
Cyclopentasilane Radical Anions.  
AD-A162 248  
Reprint: Does Chair Cyclo-  
octatetraene Exist?  
AD-A162 874  
Reprint: Convenient Syntheses of  
Dodecamethylcyclohexasilane und  
Decamethylcyclopentasilane.  
AD-A162 123
- \*DAMAGE  
Analysis of Progressive Matrix  
Cracking in Composite Laminates.\*  
AD-A162 220
- \*DAMPING  
Passively Damped Joints for  
Advanced Space Structures.\*  
AD-A162 257  
Study of Characteristics of Dry  
Friction Damping.\*  
AD-A162 770
- \*DATA BASES  
Request for Instrumentation.\*  
AD-A161 421  
Specification for MIDAS-GR.  
Management of Information for  
Design and Analysis of System.  
Generalized Relational Model.\*  
AD-A162 086  
Database Design Methodology and  
Database Management System for  
Computer-Aided Structural Design  
Optimization.\*  
AD-A162 101  
Database Management in Design  
Optimization.\*  
AD-A162 212  
Database Design for Structural  
Analysis and Design Optimization.\*  
AD-A162 355  
A Generalized DBMS to Support  
Diverse Data.\*  
AD-A162 384
- \*DATA MANAGEMENT  
Request for Instrumentation.\*  
AD-A161 421  
Database Design Methodology and  
Database Management System for  
Computer-Aided Structural Design  
Optimization.\*  
AD-A162 101  
Database Management in Design  
Optimization.\*  
AD-A162 212  
A Generalized DBMS to Support  
Diverse Data.\*  
AD-A162 384
- \*DATA PROCESSING  
Numerical Algorithms & Parallel  
Tasking.\*  
AD-A162 221
- \*DEBUGGING(COMPUTERS)  
Fault Diversity in Software  
Reliability.\*  
AD-A162 757
- \*DEFECTS(MATERIALS)  
Reprint: Dynamics and Kinetics  
on Surfaces Exhibiting Defects.  
AD-A162 908
- \*DESORPTION  
Reprint: Surface Bonding of the  
NH3 and NH2 Species to Ni(110).  
AD-A162 270  
Reprint: Monte Carlo Random Walk  
Study of Recombination and  
Desorption of Hydrogen on Si(111).  
AD-A162 278  
Reprint: Adsorption and  
Desorption of NO from Rh(111) and  
Rh(331) Surfaces.  
AD-A162 831
- \*DETECTION  
On Detection of Number of  
Signals in Presence of Colored  
Noise Using Information Theoretic  
Criteria.\*  
AD-A161 847  
Effects of Estimated Noise  
Covariance Matrix in Optimal Signal

SUBJECT INDEX-6  
UNCLASSIFIED EVK551

CRA-DET

# UNCLASSIFIED

- Detection \*  
AD-A162 796
- \*DETECTORS  
Electromagnetic Sensor Arrays  
for Nondestructive Evaluation and  
Robot Control.\*  
AD-A161 292
- \*DETONATIONS  
Prediction of Detonation  
Transition in Porous Explosives  
from Rapid Compression Loadings.\*  
AD-A162 767
- \*DIATOMIC MOLECULES  
Dissociative Electron Attachment  
to Rovibrationally Excited  
Molecules.\*  
AD-A163 065
- \*DIBORANES  
Reprint: Synthesis of a 1,3-  
Dioxo-2,4-diboretane: An Oxo borane  
Precursor.  
AD-A162 497
- \*DIFFERENTIAL EQUATIONS  
Heteroclinic Orbits for Retarded  
Functional Differential Equations.\*  
AD-A162 374
- \*DIFFERENTIAL TOPOLOGY  
Applications of Differential  
Topology to Grid Generation.\*  
AD-A162 834
- \*DIFFUSION  
Nearly Optimal State Feedback  
Controls for Stochastic Systems  
with Wideband Noise Disturbances.\*  
AD-A162 271  
Study of Transport Properties  
and Structure of Extended-Chain  
Polymers: Diffusion and Solubility  
of Gases \*  
AD-A162 768  
Fluctuations Near Homogeneous  
States of Chemical Reactions with  
Diffusion.\*  
AD-A162 875
- \*DISCRETE DISTRIBUTION  
Piecewise Geometric Estimation  
of a Survival Function.\*  
AD-A161 322  
M-Estimation for Discrete Data.  
Asymptotic Distribution Theory and  
Implications.\*  
AD-A162 779
- \*DISSOCIATION  
Reprint: Quantum Mechanical  
Partitioning of Kinetic Energy in  
Collision-Induced Dissociation.  
AD-A161 167
- \*DISTRIBUTION FUNCTIONS  
On the Distribution of the  
Singular Values of Toeplitz  
Matrices.\*  
AD-A161 146  
An Inequality Concerning the  
Deviation between Theoretical and  
Empirical Distributions.\*  
AD-A162 169  
Reprint: Inconsistency of the  
Maximum Likelihood Estimator of a  
Distribution Having Increasing  
Failure Rate Average.  
AD-A162 199
- \*DOPING  
Re-Evaluation of Surface  
Properties of Oxide-Cathode  
Materials.\*  
AD-A161 131
- \*DOPPLER RADAR  
The Turbulent Gravity Wave-  
Critical Level Encounter in the  
Evolution of Atmospheric Flow.\*  
AD-A162 335  
Reprint: Direct Measurement of  
Large-Scale Vertical Velocities  
Using Clear-Air Doppler Radars.  
AD-A162 973  
The Interaction and Variation of  
Waves and Turbulence from MST Radar  
Data.\*  
AD-A162 983  
Reprint: Doppler Radar  
Measurements of Turbulence in the
- Clear Air.  
AD-A162 991
- \*DRUGS  
Reprint: Laser Raman  
Investigation of Drug-Polymer  
Conjugates: Sulfathiazole-Povidone  
Copolymerizates.  
AD-A161 115
- \*DYNAMIC PROGRAMMING  
Finding Test-and-Treatment  
Procedures Using Parallel  
Computation.\*  
AD-A162 141  
Sequential Decision Models in  
Reliability.\*  
AD-A162 332
- \*EARTHQUAKES  
Earthquake Light.\*  
AD-A161 385
- \*ELASTIC PROPERTIES  
On the Role of Dimensionless  
Elastic Fracture Mechanics.\*  
AD-A161 285  
Reprint: Network Topology and  
the Theory of Rubber Elasticity.  
AD-A162 829  
Reprint: Molecular Theory of  
Rubber Elasticity.  
AD-A162 952
- \*ELASTIC SCATTERING  
Reprint: Semiclassical Wave  
Packet Studies of Elastic and  
Inelastic Atom-Surface Scattering  
from a 3D Model Surface.  
AD-A162 892
- \*ELECTRIC SWITCHES  
The Influence of Fluid Mechanics  
on the Behavior of Gas-Blown Spark  
Gap Switches.\*  
AD-A161 298
- \*ELECTRICAL CONDUCTIVITY  
Reprint: On Ionic Association in  
Ambient Temperature Chloroaluminate  
Molten Salts. Analysis of

SUBJECT INDEX-7  
UNCLASSIFIED EVK551

DET-ELE

# UNCLASSIFIED

Electrochemical and Conductance Data.  
AD-A161 169

\*ELECTRICAL ENGINEERING  
USAF/SCEE (United States Air Force/Southeastern Center for Electrical Engineering Education) Research Initiation Program Research Reports. Volume 1.\*  
AD-A161 907

USAF/SCEE (United States Air Force/Southeastern Center for Electrical Engineering Education) Research Initiation Program Research Reports. Volume 2.\*  
AD-A161 908

## \*ELECTROACOUSTICS

Reprint: Nonlinear Electroacoustic Phenomena: Phono Echo in d-Tartaric Acid and Its Salts.  
AD-A161 140

## \*ELECTROCARDIOGRAPHY

Modeling Electrocardiograms Using Interacting Markov Chains.\*  
AD-A162 758  
A Markov Chain Approach to Electrocardiogram Modeling and Analysis.\*  
AD-A162 778

## \*ELECTROCHEMISTRY

Reprint: Electrochemical Oxidation of Some Metal Carbonyls in Ambient Temperature Ionic Liquids.  
AD-A161 168

Reprint: On Ionic Association in Ambient Temperature Chloroaluminate Molten Salts. Analysis of Electrochemical and Conductance Data.  
AD-A161 169

Reprint: Electrochemical Studies of Iodine in an Aluminum Chloride-Butylpyridinium Chloride Ionic Liquid. Part 2. Neutral and Basic Solvent Composition.

AD-A162 075

Reprint: Electrochemical Studies of Ferrocene and Ferrocenium Ion in Aluminum Chloride-N-1-Butylpyridinium Chloride Ionic Liquid.  
AD-A162 076

Reprint: Electrochemistry in Neutral Ambient-Temperature Ionic Liquids. 1. Studies of Iron (III), Neodymium (III), and Lithium (I).  
AD-A162 077

Reprint: Electrochemical Reduction of N-(1-Butyl)Pyridinium Cation in 1-Methyl-3-Ethylimidazolium Chloride-Aluminum Chloride Ambient Temperature Ionic Liquids.  
AD-A162 078

## \*ELECTRON NUCLEAR DOUBLE RESONANCE

Reprint: Electron Nuclear Double Resonance Spectra of Cis-Rich and Trans-Rich Polyacetylenes between 1.9 and 4.2 K.  
AD-A162 816

## \*ELECTRON SPECTROSCOPY

Reprint: Electron Nuclear Double Resonance Spectra of Cis-Rich and Trans-Rich Polyacetylenes between 1.9 and 4.2 K.  
AD-A162 816

## \*ELECTRON SPIN RESONANCE

Reprint: ESR (Electron Spin Resonance) Spectra for Anion Radicals of Alkylcyclo-tetrasilanes and Cyclopentasilanes.  
AD-A162 919

## \*ELECTRON TRANSITIONS

Theoretical Studies of Laser-Induced Molecular Rate Processes: Topics in Line Broadening and Spectroscopy.\*  
AD-A161 132

Infrared Emission and Atomic Transitions.\*  
AD-A162 245

## \*ELECTRON TRANSPORT

Electron Production, Electron Attachment, and Charge Recombination Process in High Pressure Gas Discharges.\*  
AD-A162 747

## \*ELECTRONIC STATES

Reprint: Rotation-Induced Vibrational Mixing in X' 1A1 Formaldehyde: Non-Negligible Dynamical Consequences of Rotation.  
AD-A161 284

Reprint: Electronic Structure of the Phosphoryl and Thiophosphoryl Bonds.  
AD-A162 809

## \*ELECTRONIC SWITCHES

Mega-Amp Opening Switch with Nested Electrodes/Pulsed Generator of Ion and Ion Cluster Beams.\*  
AD-A162 850

## \*ELLIPSES

Numerical Generation of 3D Curvilinear Coordinate Systems and Computational Grids for Aircraft Configurations.\*  
AD-A162 249

## \*EMISSION SPECTRA

Reprint: Spontaneous Emission by Two Atoms with Different Resonance Frequencies near Metal Surface.  
AD-A161 123

Reprint: Intramolecular Vibrational Dynamics Including Rotational Degrees of Freedom. Chaos and Quantum Spectra.  
AD-A161 313

Infrared Emission and Atomic Transitions.\*  
AD-A162 245

Reprint: The A' 3Pi(2 sub u)-X 1 Sigma ( ) sub g Emission Spectrum of Br2 in an Argon Matrix.  
AD-A163 111

## \*ENERGY CONVERSION

Variable Band Gap Materials for

SUBJECT INDEX-8  
UNCLASSIFIED EVK551

ELE-ENE

UNCLASSIFIED

- Thermophotovoltaic Generators.\*  
AD-A161 987
- \*ENERGY GAPS  
Variable Band Gap Materials for  
Thermophotovoltaic Generators.\*  
AD-A161 987
- \*ENERGY TRANSFER  
Reprint: Rocket-Borne  
Measurements of Atmospheric  
Infrared Fluxes.  
AD-A162 819  
Reprint: Theory of Excitation  
Transfer between Rydberg Atoms.  
AD-A162 986
- \*ENZYMES  
Reprint: Alternative View of  
Enzyme Reactions.  
AD-A162 198
- \*EPITAXIAL GROWTH  
Microwave Semiconductor Research  
Materials, Devices and Circuits.\*  
AD-A162 021
- \*EQUATIONS  
On an Estimate for the Three-  
Grid MGR Multigrid Method.\*  
AD-A161 096
- \*ERROR ANALYSIS  
Reprint: Local Error Estimated  
for Parametrized Nonlinear  
Equations.  
AD-A161 077
- \*ERROR CORRECTION CODES  
The Correction of 111-Formed  
Input Using History-Based  
Expectation with Applications to  
Speech Understanding.\*  
AD-A162 222
- \*ERROR DETECTION CODES  
A Study of Error Detection and  
Correction Codes.\*  
AD-A162 196
- \*ESTERS
- Reprint: The Ab Initio Structure  
of O-Methyl  
Methylphosphonofluoridate.  
AD-A162 817
- \*ESTIMATES  
Efficiency Loss with the Kaplan-  
Meter Estimator.\*  
AD-A161 341  
Some General Probabilistic  
Estimations for the Rate of  
Convergence in Operator Semigroup  
Representations.\*  
AD-A161 359  
Effects of Estimated Noise  
Covariance Matrix in Optimal Signal  
Detection.\*  
AD-A162 796
- \*ETHERS  
Reprint: Polyaromatic Ether-  
Ketones and Polyaromatic Ether-  
Ketone Sulfonamides from 4-  
Phenoxybenzoyl Chloride and from  
4,4'-Dichloroformyldiphenyl Ether.  
AD-A161 265  
Reprint: Adamantylidimethylsilyl  
Ethers.  
AD-A162 073
- \*ETHYLENE  
Reprint: The Intrinsic Reaction  
Coordinate and the Rotational  
Barrier in Silaethylene.  
AD-A162 922
- \*EXHAUST GASES  
Atomic and Molecular Gas Phase  
Spectrometry.\*  
AD-A162 339
- \*EXPLOSIVES  
Prediction of Detonation  
Transition in Porous Explosives  
from Rapid Compression Loadings.\*  
AD-A162 767
- \*EXTERNAL STORES  
Optimization of Tip Store  
Modeling.\*  
AD-A162 119
- \*FABRICATION  
A Program of Research on  
Microfabrication Techniques for  
VLSI Magnetic Devices.\*  
AD-A161 271
- \*FAN BLADES  
Research on Aero-Thermodynamic  
Distortion Induced Structural  
Dynamic Response of Multi-Stage  
Compressor Blading.\*  
AD-A162 432
- \*FAULT TOLERANT COMPUTING  
Reprint: Dynamically  
Restructurable Fault-Tolerant  
Processor Network Architectures.  
AD-A161 358
- \*FIBER OPTICS  
Reprint: Passive Fiber-Optic  
Ring Resonator for Rotation  
Sensing.  
AD-A162 943
- \*FIBER REINFORCED COMPOSITES  
Reprint: Internal Damping of  
Short-Fiber Reinforced Polymer  
Matrix Composites.  
AD-A162 311
- \*FIBERS  
Analysis of Progressive Matrix  
Cracking in Composite Laminates.\*  
AD-A162 220
- \*FILTERS  
Effects of Estimated Noise  
Covariance Matrix in Optimal Signal  
Detection.\*  
AD-A162 796
- \*FINITE DIFFERENCE THEORY  
Stability Analysis of Finite  
Difference Schemes for Hyperbolic  
Systems, and Problems in Applied  
and Computational Linear Algebra.\*  
AD-A161 092  
Numerical Methods for  
Differential Equations.\*  
AD-A162 722

SUBJECT INDEX-9  
UNCLASSIFIED EVK551

ENE-FIN



# UNCLASSIFIED

- \*FINITE ELEMENT ANALYSIS  
Nonlinear Analysis and Optimal Design of Dynamic Mechanical Systems for Spacecraft Application.\*  
AD-A162 194  
Reprint: Adaptive Finite Element Methods and the Numerical Solution of Shear Band Problems.  
AD-A162 206
- \*FISHERIES  
Reprint: A Stochastic Population Model for Managing the Atlantic Menhaden (Brevoortia tyrannus) Fishery and Assessing Managerial Risks.  
AD-A162 112
- \*FITTING FUNCTIONS(MATHEMATICS)  
Reprint: Goodness-of-Fit Tests for the Weibull Distribution with Unknown Parameters and Heavy Censoring.  
AD-A161 406
- \*FLAMES  
Reprint: Numerical Study of Quenching of Inward Propagating Spherical Flames.  
AD-A162 501
- \*FLEXIBLE STRUCTURES  
Exploration of the Maximum Entropy/Optimal Projection Approach to Control Design Synthesis for Large Space Structures.\*  
AD-A161 355
- \*FLUORESCENCE  
Semiconductors Investigated by Picosecond Absorption, Fluorescence and Raman Time-Resolved Spectroscopy.\*  
AD-A162 303
- \*FLUORINATED HYDROCARBONS  
New Approaches to the Synthesis of Fluorocarbons.\*  
AD-A162 020
- \*FLUORINE  
Reprint: Neutralization and Excitation in Low-Energy Ion-Surface Collisions.  
AD-A163 011
- \*FLUTTER  
Optimization of Tip Store Modeling.\*  
AD-A162 119  
Stochastic Non-Linear Flutter of Aeroelastic Structures.\*  
AD-A162 748
- \*FORMALDEHYDE  
Reprint: State-Specific Rates of H<sub>2</sub>CO(So) Yields H<sub>2</sub> at Energies Near the Top of Barrier: A Violation of RRKM Theory.  
AD-A161 229  
Reprint: Rotation-Induced Vibrational Mixing in X' 1A1 Formaldehyde: Non-Negligible Dynamical Consequences of Rotation.  
AD-A161 284  
Reprint: Intramolecular Vibrational Dynamics Including Rotational Degrees of Freedom. Chaos and Quantum Spectra.  
AD-A161 313
- \*FOURIER SPECTROMETERS  
New Approaches to the Synthesis of Fluorocarbons.\*  
AD-A162 020
- \*FOURIER SPECTROSCOPY  
Reprint: Time-Resolved Infrared Emission Studies of CO(2) Formed by CO Oxidation on Pt and Pd.  
AD-A161 168
- \*FRACTURE(MECHANICS)  
On the Role of Dimensionless Elastic Fracture Mechanics.\*  
AD-A161 285  
Nonlinear Fracture Mechanics Analysis with the Boundary Integral Method.\*  
AD-A162 027  
Fracture Behavior of Boron
- Aluminum Composites at Room and Elevated Temperatures.\*  
AD-A162 352  
Analysis and Experiments on Interlaminar Fracture Toughness in Resin Matrix Composites.\*  
AD-A162 689
- \*FREE ELECTRONS  
Fundamental Experiments at Liquid Helium Temperatures (Low Temperature Studies of Anomalous Surface Shielding and Related Phenomena).\*  
AD-A162 392
- \*FREE FALL MODELS  
Fundamental Experiments at Liquid Helium Temperatures (Low Temperature Studies of Anomalous Surface Shielding and Related Phenomena).\*  
AD-A162 392
- \*FREQUENCY STANDARDS  
Investigation of Rubidium Hyperfine Structure Frequency Stabilization Mechanisms.\*  
AD-A162 388
- \*FRONTS(METEOROLOGY)  
Reprint: Two-Dimensional Primitive Equation Model of Frontogenesis Forced by Confluence and Horizontal Shear.  
AD-A162 814  
Reprint: Diagnosis of Ageostrophic Circulations in a Two-Dimensional Primitive Equation Model of Frontogenesis.  
AD-A162 815
- \*FUEL AIR EXPLOSIVES  
Requirements for Initiation and Sustained Propagation of Fuel-Air Explosives.\*  
AD-A162 301
- \*FUNCTIONS  
Reprint: Scaling of Nonlocal Operators.

SUBJECT INDEX-10  
EVR551

FIN-FUN

# UNCLASSIFIED

AD-A182 929

## \*FUSED SALTS

Reprint: Electrochemical  
Oxidation of Some Metal Carbonyls  
in Ambient Temperature Ionic  
Liquids.  
AD-A181 168

Reprint: On Ionic Association in  
Ambient Temperature Chloroaluminate  
Molten Salts. Analysis of  
Electrochemical and Conductance  
Data.  
AD-A181 169

## \*FUSED SILICA

Reprint: Temperature Dependence  
of the Vibrational Population  
Lifetime of OH(v=1) in Fused  
Silica.  
AD-A182 700

## \*GALLIUM ARSENIDES

Variable Band Gap Materials for  
Thermophotovoltaic Generators.\*

AD-A181 987

Microwave Semiconductor Research  
Materials. Devices and Circuits.\*  
AD-A182 021

Analytical Investigations of  
Bulk Wave Resonators in the  
Piezoelectric Thin Film on Gallium-  
Arsenide Configuration.\*

AD-A182 068

Infrared Nonlinear Processes in  
Semiconductors.\*

AD-A182 096

## \*GAS BREAKDOWN

The Influence of Fluid Mechanics  
on the Behavior of Gas-Blown Spark  
Gap Switches.\*  
AD-A181 298

## \*GAS SURFACE INTERACTIONS

Laser-Induced Kinetics: An  
Experimental and Theoretical  
Program \*

AD-A181 994

Reprint: Semiclassical Wave  
Packet Studies of Elastic and

Inelastic Atom-Surface Scattering  
from a 3D Model Surface.  
AD-A162 692

## \*GAUSSIAN QUADRATURE

Theory and Applications of  
Random Fields.\*  
AD-A162 277

## \*GB AGENT

Reprint: Quantum Theoretical  
Determination of the Molecular  
Structure of some  
Anticholinesterase Agents.  
AD-A162 074

## \*GD AGENT

Reprint: Quantum Theoretical  
Determination of the Molecular  
Structure of some  
Anticholinesterase Agents.  
AD-A162 074

## \*GEOSTROPHIC WIND

Reprint: Diagnosis of  
Ageostrophic Circulations in a Two-  
Dimensional Primitive Equation  
Model of Frontogenesis.  
AD-A162 815

## \*GERMANIUM COMPOUNDS

Reprint: Organogermane  
Homopolymers and Copolymers with  
Organosilanes.  
AD-A182 923

## \*GLASS

QW85. Basic Properties of  
Optical Materials Summaries of  
Papers.\*  
AD-A181 247

## \*GRAIN BOUNDARIES

Role of Interfaces in  
Deformation and Strengthening.\*  
AD-A182 289

## \*GRANULES

Generalized Phenomenological  
Cyclic Stress-Strain-Strength  
Characterization of Anisotropic

Granular Media.\*  
AD-A162 348

## \*GRAPHITE

Structure-Property Relationships  
in Intercalated Graphite.\*  
AD-A182 326

## \*GRAVITY WAVES

The Turbulent Gravity Wave-  
Critical Level Encounter in the  
Evolution of Atmospheric Flow.\*  
AD-A162 335  
Measurement of Horizontal  
Structures and Wavelengths (5-500  
km) in Mesospheric Gravity Waves.  
Tides and Winds. Workshop and  
Design Study.\*

AD-A182 788

Reprint: Fluxes of Heat and  
Constituents Due to Convectively  
Unstable Gravity Waves.  
AD-A162 830

## \*GRIDS(COORDINATES)

Numerical Generation of 3D  
curvilinear Coordinate Systems and  
Computational Grids for Aircraft  
Configurations.\*  
AD-A182 249

## \*GROUP III COMPOUNDS

Clustering and Ordering in III-V  
Alloys.\*  
AD-A181 099

## \*GROUP V COMPOUNDS

Clustering and Ordering in III-V  
Alloys.\*  
AD-A181 099

## \*HALL EFFECT

Superlattice Effects in Graphite  
Intercalation Compounds.\*  
AD-A182 373

## \*HALOGENATION

Laser-Induced Kinetics: An  
Experimental and Theoretical  
Program \*  
AD-A181 994

SUBJECT INDEX-11

UNCLASSIFIED EVK551

FUS-HAL

# UNCLASSIFIED

- \*HEAT RESISTANT ALLOYS  
Ordered Carbon - Metal Alloys  
for Extraterrestrial Power  
Systems.\*  
AD-A162 287
- \*HIGH GAIN  
Reprint: A Smooth Algorithm for  
Adaptive Stabilization of a  
Discrete Linear System with an  
Unknown High Frequency Gain.  
AD-A162 247
- \*HIGH STRENGTH ALLOYS  
Ordered Carbon - Metal Alloys  
for Extraterrestrial Power  
Systems.\*  
AD-A162 287
- \*HOLOGRAMS  
Reprint: Computer Generated  
Holograms in Pattern Recognition: A  
Review.  
AD-A162 989
- \*HOT PRESSING  
Understanding the HIP (Hot  
Isostatic Pressing) Consolidation  
of P/M Nickel-Base Superalloys.\*  
AD-A162 387
- \*HYDROGEN  
Reprint: State-Specific Rates of  
H<sub>2</sub>CO(So) Yields H<sub>2</sub> at Energies  
Near the Top of Barrier: A  
Violation of RRKM Theory.  
AD-A161 229  
Reprint: Monte Carlo Random Walk  
Study of Recombination and  
Desorption of Hydrogen on Si(111).  
AD-A162 278
- \*HYDROXYL RADICALS  
Reprint: Nonlinear  
Electroacoustic Phenomena: Phono  
Echo in d-Tartaric Acid and Its  
Salts.  
AD-A161 140  
Reprint: Temperature Dependence  
of the Vibrational Population  
Lifetime of OH(v=1) in Fused  
Silica.  
AD-A162 700  
Reprint: Picosecond Vibrational  
Energy Relaxation of Surface  
Hydroxyl Groups on Colloidal  
Silica.  
AD-A162 797  
Reprint: Vibrational  
Deactivation of Surface OH  
Chemisorbed on SiO<sub>2</sub> sub 2: Solvent  
Effects.  
AD-A162 803  
Reprint: Time Resolved  
Measurements of Vibrational  
Relaxation of Molecules on  
Surfaces: Hydroxyl Groups on  
Silica.  
AD-A162 899
- \*HYPERFINE STRUCTURE  
Investigation of Rubidium  
Hyperfine Structure Frequency  
Stabilization Mechanisms.\*  
AD-A162 388
- \*IMAGE PROCESSING  
Optical Acquisition, Image and  
Data Compression.\*  
AD-A161 650
- \*IMPREGNATION  
A New Process for Final  
Densification of Ceramics.\*  
AD-B096 961L
- \*IN VIVO ANALYSIS  
Development and Use of  
Anucleated Bacterial Cells to Assay  
the in vivo Activity of  
Pollutants.\*  
AD-A162 727
- \*INELASTIC SCATTERING  
Reprint: Semiclassical Wave  
Packet Studies of Elastic and  
Inelastic Atom-Surface Scattering  
from a 3D Model Surface.  
AD-A162 692
- \*INEQUALITIES  
Moment and Geometric Probability
- Inequalities Arising from  
Arrangement Increasing Functions.\*  
AD-A161 273  
An Inequality Concerning the  
Deviation between Theoretical and  
Empirical Distributions.\*  
AD-A162 189  
Reprint: Some Inequalities for  
1p Norms of Matrices.  
AD-A162 238
- \*INFORMATION THEORY  
On Detection of Number of  
Signals in Presence of Colored  
Noise Using Information Theoretic  
Criteria.\*  
AD-A161 847
- \*INFRARED LASERS  
Reprint: Theory of Laser-  
Stimulated Surface Processes. II. A  
Generalized-Master-Equation  
Approach to Energy Transfer between  
an IR Laser, an Adspecies, and  
Phonons.  
AD-A163 010
- \*INFRARED OPTICAL MATERIALS  
OM85. Basic Properties of  
Optical Materials Summaries of  
Papers.\*  
AD-A161 247
- \*INFRARED RADIATION  
Infrared Nonlinear Processes in  
Semiconductors.\*  
AD-A162 098  
Reprint: Nascent Product-  
Vibrational State Distributions of  
Thermal Ion-Molecule Reactions  
Determined by Infrared  
Chemiluminescence.  
AD-A162 693  
Reprint: Rocket-Borne  
Measurements of Atmospheric  
Infrared Fluxes.  
AD-A162 819
- \*INFRARED SPECTRA  
Measurement of Atmospheric  
Transmission Over Long Paths in the

UNCLASSIFIED  
SUBJECT INDEX-12  
EVK551

HEA-INF

# UNCLASSIFIED

Infrared Spectral Region. \*  
AD-A161 258  
Infrared Emission and Atomic  
Transitions. \*  
AD-A162 245

\*INFRARED SPECTROSCOPY  
Reprint: Time-Resolved Infrared  
Emission Studies of CO(2) Formed by  
CO Oxidation on Pt and Pd.  
AD-A161 168  
Reprint: Terminal Distributions  
of Rotational Energy in Free Jets  
of CO and CO2.  
AD-A161 315

\*INPUT  
The Correction of Ill-Formed  
Input Using History-Based  
Expectation with Applications to  
Speech Understanding. \*  
AD-A162 222

\*INTEGRAL EQUATIONS  
Nonlinear Fracture Mechanics  
Analysis with the Boundary Integral  
Method. \*  
AD-A162 027

\*INTEGRALS  
On Stochastic Integration by  
Series of Wiener Integrals. \*  
AD-A161 514

\*INTEGRATED CIRCUITS  
A Program of Research on  
Microfabrication Techniques for  
VLSI Magnetic Devices. \*  
AD-A161 271

\*INTERFEROMETERS  
Measurement of Horizontal  
Structures and Wavelengths (5-500  
km) in Mesospheric Gravity Waves,  
Tides and Winds. Workshop and  
Design Study. \*  
AD-A162 768

\*INTERPOLATION  
Reprint: Vertical Interpolation  
of Meteorological Variables in Low-

Resolution Numerical Models.  
AD-A162 818

\*INVARIANCE  
Invariance Principles Under a  
Two-Part Mixing Assumption. \*  
AD-A162 800

\*INVERSE SCATTERING  
Reprint: The Shur Algorithm and  
Its Applications.  
AD-A161 011  
Research on the Inverse Problem  
of Scattering. \*  
AD-A161 248

\*INVERSION  
Probabilistic Solution of  
Inverse Problems. \*  
AD-A161 130

\*IODIDES  
Reprint: Photodissociation  
Dynamics of Nozzle-Cooled ION.  
AD-A161 659  
Reprint: Collisional  
Deactivation of K(5(2)P(J)) by  
H(2). Identification of the Primary  
Quenching Channel.  
AD-A162 903  
Reprint: Zinc Iodide Catalyzed  
Reaction of Oxetanes with  
Trimethylsilyl Cyanide.  
AD-A163 064

\*IODINE  
Reprint: Electrochemical Studies  
of Iodine in an Aluminum Chloride-  
Butylpyridinium Chloride Ionic  
Liquid. Part 2. Neutral and Basic  
Solvent Composition.  
AD-A162 075

\*ION BEAMS  
Dissociative Electron Attachment  
to Rovibrationally Excited  
Molecules. \*  
AD-A163 065

\*ION BOMBARDMENT  
Reprint: Velocity Dependence of

Azimuthal Anisotropies in Ion  
Scattering from Rhodium (111).  
AD-A162 872

\*ION ION INTERACTIONS  
Reprint: Velocity Dependence of  
Azimuthal Anisotropies in Ion  
Scattering from Rhodium (111).  
AD-A162 872

\*IONIZATION  
Reprint: Multiple Resonances in  
Non-Franck-Condon Transitions due  
to Nonlocal Effects in Laser-  
Induced Associative Ionization.  
AD-A161 316  
Dissociative Electron Attachment  
to Rovibrationally Excited  
Molecules. \*  
AD-A163 065

\*IONOSPHERE  
High Frequency Radar Studies of  
the Very High Latitude Ionosphere. \*  
AD-A162 754

\*IRON  
Reprint: Electrochemistry in  
Neutral Ambient-Temperature Ionic  
Liquids. 1. Studies of Iron (III),  
Neodymium (III), and Lithium (I).  
AD-A162 077

\*ISOMERIZATION  
Reprint: The Dynamics of Barrier  
Crossings in Solution: The Effect  
of a Solvent Polarity-Dependent  
Barrier.  
AD-A162 892

\*ISOSTATIC PRESSING  
Understanding the HIP (Hot  
Isostatic Pressing) Consolidation  
of P/M Nickel-Base Superalloys. \*  
AD-A162 387

\*JET FLOW  
Reprint: On the Time Required to  
Reach Fully Developed Flow in  
Pulsed Supersonic Free Jets.  
AD-A161 283

SUBJECT INDEX-13  
UNCLASSIFIED EVK551

INF-JET

# UNCLASSIFIED

Reprint: Terminal Distributions  
of Rotational Energy in Free Jets  
of CO and CO<sub>2</sub>.  
AD-A181 315

\*JOINTS  
Passively Damped Joints for  
Advanced Space Structures.\*  
AD-A182 257

\*KERNEL FUNCTIONS  
Some Convergence Results for  
Kernel-Type Quantile Estimators  
under Censoring.\*  
AD-A182 837

\*KETONES  
Reprint: Polyaromatic Ether-  
Ketones and Polyaromatic Ether-  
Ketone Sulfonamides from 4-  
Phenoxybenzoyl Chloride and from  
4,4'-Dichloroformylidiphenyl Ether.  
AD-A181 265

Reprint: The Observation of  
CIDEP (Chemically Induced Dynamic  
Electron Polarization) from the  
Photodecomposition of Dibenzyl  
Ketone in Micellar Solution.  
AD-A181 660

\*LABORATORY EQUIPMENT  
Equipment Acquired by Columbia  
University Center for Strategic  
Materials under DoD University  
Research Instrumentation Program.\*  
AD-A182 185

\*LAMINATES  
Nonlinear Dynamic Response of  
Composite Rotor Blades.\*  
AD-A182 158  
Analysis of Progressive Matrix  
Cracking in Composite Laminates.\*  
AD-A182 220  
Fracture Behavior of Boron  
Aluminum Composites at Room and  
Elevated Temperatures.\*  
AD-A182 352  
Delamination Buckling and Growth  
of Flat Composite Structural  
Elements.\*

AD-A182 370  
Buckling of Delaminated Shells  
and Multi-Annular Plates.\*  
AD-A182 371

\*LAPLACE TRANSFORMATION  
Real Inversion Formulas for  
Laplace and Stieltjes Transforms.\*  
AD-A181 270

\*LASER APPLICATIONS  
Laser Evaporation Studies.\*  
AD-A182 346

\*LASER INDUCED FLUORESCENCE  
Reprint: Multiple Resonances in  
Non-Franck-Condon Transitions due  
to Nonlocal Effects in Laser-  
Induced Associative Ionization.  
AD-A181 318  
Reprint: Photodissociation  
Dynamics of Nozzle-Cooled ICN.  
AD-A181 659

Reprint: Laser Induced  
Fluorescence Study of the HeBr<sub>2</sub> Van  
Der Waals Complex.  
AD-A182 981

\*LASERS  
Reprint: Laser Induced  
Fluorescence Study of the HeBr<sub>2</sub> Van  
Der Waals Complex.  
AD-A182 981

\*LIGHT  
Earthquake Light.\*  
AD-A181 385

\*LINEAR ALGEBRA  
Stability Analysis of Finite  
Difference Schemes for Hyperbolic  
Systems, and Problems in Applied  
and Computational Linear Algebra.\*  
AD-A181 092

\*LINEAR SYSTEMS  
Numerical Generation of 3D  
curvilinear Coordinate Systems and  
Computational Grids for Aircraft  
Configurations.\*  
AD-A182 249

On a Theory of Control for  
Linear Systems Over Rings and  
Nonlinear/Time-Varying Systems.\*  
AD-A182 680  
An Algebraic Approach to Time  
Scale Analysis and Control.\*  
AD-A182 808  
Reprint: Adaptive Stabilization  
of Linear Systems with Unknown High-  
Frequency Gains.  
AD-A182 921

\*LITHIUM  
Reprint: Electrochemistry in  
Neutral Ambient-Temperature Ionic  
Liquids. 1. Studies of Iron (III),  
Neodymium (III), and Lithium (I).  
AD-A182 077

\*LOGIC  
Knowledge Representation and  
Natural-Language Semantics.\*  
AD-A182 389

\*MAGNETIC FIELDS  
Reprint: Magnetic Field Effect  
on the Intersystem Crossing Rate  
Constants of Biradicals Measured by  
Nanosecond Transient UV Absorption.  
AD-A182 984

\*MAINTENANCE  
Reliability Assessment for  
Systems Subject to Maintenance and  
Repair.\*  
AD-A182 029

\*MANAGEMENT INFORMATION SYSTEMS  
Database Design Methodology and  
Database Management System for  
Computer-Aided Structural Design  
Optimization.\*  
AD-A182 101  
Database Management in Design  
Optimization.\*  
AD-A182 212

\*MANAGEMENT PLANNING AND CONTROL  
Database Design Methodology and  
Database Management System for  
Computer-Aided Structural Design

SUBJECT INDEX-14  
UNCLASSIFIED EVK551

JOI-MAN

UNCLASSIFIED

- Optimization.\*  
AD-A162 101  
Database Management in Design  
Optimization.\*  
AD-A162 212
- \*MAPPING (TRANSFORMATIONS)  
Continuum Structure Functions.\*  
AD-A162 353
- \*MARKOV PROCESSES  
Transient Solution of Acyclic  
Markov Chains.\*  
AD-A162 314  
Markov Processes Applied to  
Control, Replacement, and Signal  
Analysis.\*  
AD-A162 431  
The Reduction of Perturbed  
Markov Generators: An Algorithm  
Exposing the Role of Transient  
States.\*  
AD-A162 773  
A Markov Chain Approach to  
Electrocardiogram Modeling and  
Analysis.\*  
AD-A162 778  
Computer-Aided Engineering.\*  
AD-A162 811  
Fluctuations Near Homogeneous  
States of Chemical Reactions with  
Diffusion.\*  
AD-A162 875
- \*MASS SPECTROMETRY  
Reprint: Angle-Resolved  
Secondary Ion Mass Spectrometry.  
AD-A161 226
- \*MATHEMATICAL FILTERS  
Research on the Inverse Problem  
of Scattering.\*  
AD-A161 248
- \*MATHEMATICAL MODELS  
Reprint: A Stochastic Population  
Model for Managing the Atlantic  
Menhaden (*Brevortia tyrannus*)  
Fishery and Assessing Managerial  
Risks.  
AD-A162 112
- The Reliability of Load Sharing  
Systems.\*  
AD-A162 121  
Reprint: Adaptive Finite Element  
Methods and the Numerical Solution  
of Shear Band Problems.  
AD-A162 206  
Continuum Structure Functions.\*  
AD-A162 353  
Reprint: Transformations which  
Preserve Convexity.  
AD-A162 681  
Modeling Electrocardiograms  
Using Interacting Markov Chains.\*  
AD-A162 758  
A Markov Chain Approach to  
Electrocardiogram Modeling and  
Analysis.\*  
AD-A162 778  
A 4(n+1)-Dimensional Model  
Reference Adaptive Control for the  
Stabilization of any Strictly  
Proper Minimum Phase Linear Systems  
with Relative Degree Not Exceeding  
Two and Dimension Not Exceeding n.\*  
AD-A162 808  
Reprint: Two-Dimensional  
Primitive Equation Model of  
Frontogenesis Forced by Confluence  
and Horizontal Shear.  
AD-A162 814  
Reprint: Diagnosis of  
Ageostrophic Circulations in a Two-  
Dimensional Primitive Equation  
Model of Frontogenesis.  
AD-A162 815  
Reprint: Combining Experiments  
under Gauss-Markov Models.  
AD-A163 095
- \*MATHEMATICAL PREDICTION  
On Prediction of Harmonizable  
Stable Processes.\*  
AD-A161 412  
Prediction of Detonation  
Transition in Porous Explosives  
from Rapid Compression Loadings.\*  
AD-A162 767
- \*MATHEMATICAL PROGRAMMING  
The Application of Generalized
- Geometric Programming (Conjugate  
Duality) to the Analysis and  
Solution of Convex Programs.\*  
AD-A162 288
- \*MATRICES (MATHEMATICS)  
Limiting Spectral Distribution  
for a Class of Random Matrices.\*  
AD-A161 059  
On the Distribution of the  
Singular Values of Toeplitz  
Matrices.\*  
AD-A161 148
- \*MATRIX MATERIALS  
Reprint: Internal Damping of  
Short-Fiber Reinforced Polymer  
Matrix Composites.  
AD-A162 311
- \*MAXIMUM LIKELIHOOD ESTIMATION  
Reprint: Inconsistency of the  
Maximum Likelihood Estimator of a  
Distribution Having Increasing  
Failure Rate Average.  
AD-A162 199
- \*MEMORY DEVICES  
An Analysis and Simulation of  
the CRAY X-MP Memory System.\*  
AD-A162 789
- \*MERCURY COMPOUNDS  
Nonlinear Optical Phenomena in  
Solids.\*  
AD-A162 394
- \*MESOSPHERE  
Measurement of Horizontal  
Structures and Wavelengths (5-500  
km) in Mesospheric Gravity Waves,  
Tides and Winds. Workshop and  
Design Study.\*  
AD-A162 788  
Reprint: Fluxes of Heat and  
Constituents Due to Convectively  
Unstable Gravity Waves.  
AD-A162 830
- \*METAL COMPLEXES  
Reprint: Cluster Complex

SUBJECT INDEX-15  
UNCLASSIFIED EVK551

MAP-MET

# UNCLASSIFIED

Metathesis. Synthesis. Structures. and Dynamic Behaviour of Bi- and Tri-metallic Hexanuclear Cluster Complexes (MM'Ru4(m)micron3-H2(CO)12(PPh3)2) (M = Cu, M' = Ag or Au; M = Ag, M = Au.  
AD-A162 873

## \*METAL MATRIX COMPOSITES

Fracture Behavior of Boron Aluminum Composites at Room and Elevated Temperatures.\*  
AD-A162 352

## \*METEORS

Measurement of Horizontal Structures and Wavelengths (5-500 km) in Mesospheric Gravity Waves, Tides and Winds. Workshop and Design Study.\*  
AD-A162 768

## \*METHANE

Reprint: Monte Carlo Transition-State Study of Angular Momentum Effects on the Unimolecular Dissociation of CH(4) on the Duchovic-Hase-Schegel ab Initio Surface.  
AD-A162 218

## \*METHYL RADICALS

Reprint: Carbene and Silicon Routes Toward a Simple Nitrile Ylide. Spectroscopic, Kinetic, and Chemical Characterization.  
AD-A162 928  
Reprint: Convenient Syntheses of Dodecamethylcyclohexasilane und Decamethylcyclopentasilane.  
AD-A163 123

## \*METHYLENES

Reprint: Singlet-Triplet Interconversion of Diphenylmethylenes Energetics, Dynamics and Reactivities of Different Spin States.  
AD-A162 882

## \*MICROMINIATURIZATION

A Program of Research on Microfabrication Techniques for VLSI Magnetic Devices.\*  
AD-A161 271

## \*MICROOPTICAL CIRCUITS

Optical Computing Research.\*  
AD-A162 272

## \*MOLECULAR BEAMS

Reprint: On the Time Required to Reach Fully Developed Flow in Pulsed Supersonic Free Jets.  
AD-A161 283

Reprint: Semiclassical Wave Packet Studies of Elastic and Inelastic Atom-Surface Scattering from a 3D Model Surface.  
AD-A162 692

## \*MOLECULAR ENERGY LEVELS

Reprint: Rotation-Induced Vibrational Mixing in X' 1A1 Formaldehyde: Non-Negligible Dynamical Consequences of Rotation.  
AD-A161 284

## \*MOLECULAR IONS

The Conference on the Dynamics of Molecular Collisions Held at Snowbird, Utah on 14-19 July 1985.\*  
AD-A161 078  
Reprint: Reduction of Nitric Oxide on the Carbon Pretreated Rh(331) Single Crystal Surface: Evidence for Molecular CN - Formation.  
AD-A162 950

## \*MOLECULAR ORBITALS

Reprint: Factors Influencing the Magnitude of Alpha-13C Hyperfine Couplings in Cyclosilane Anion Radicals.  
AD-A162 906

## \*MOLECULAR PROPERTIES

Molecular Mechanics of Polymeric Interactions.\*  
AD-A161 095

Reprint: Molecular Mechanics of Photopolymerization of 2,5-Distyrylpyrazine in Solid State.  
AD-A161 317

Reprint: The Observation of CIDEP (Chemically Induced Dynamic Electron Polarization) from the Photodecomposition of Dibenzy Ketone in Micellar Solution.  
AD-A161 660

## \*MOLECULAR SPECTROSCOPY

Theoretical Studies of Laser-Induced Molecular Rate Processes: Topics in Line Broadening and Spectroscopy.\*  
AD-A161 132  
Atomic and Molecular Gas Phase Spectrometry.\*  
AD-A162 339

## \*MOLECULAR STRUCTURE

Reprint: Ab Initio Structures of Phosphorus Acids and Esters. 1. Phosphinic, Phosphonic and Phosphoric Acids.  
AD-A161 216  
Theory and Experiments on Chemical Instabilities.\*  
AD-A162 430

Study of Transport Properties and Structure of Extended-Chain Polymers: Diffusion and Solubility of Gases.\*  
AD-A162 766

Reprint: The Ab Initio Structure of O-Methyl Methylphosphonofluoridate.  
AD-A162 817

Reprint: The Intrinsic Reaction Coordinate and the Rotational Barrier in Silaethylene.  
AD-A162 922  
Reprint: Molecular Theory of Rubber Elasticity.  
AD-A162 952

## \*MOLECULAR VIBRATION

Reprint: Distribution of Internal Energy in CO and CO2 Vibrationally Excited by a Hot

SUBJECT INDEX-16  
UNCLASSIFIED EVK551

MET-MOL

- Platinum Surface.  
AD-A161 224  
Reprint: State-Specific Rates of  $\text{H}_2\text{CO}(\text{So})$  Yields  $\text{H}_2$  at Energies Near the Top of Barrier: A Violation of RRKM Theory.  
AD-A161 229  
Reprint: Rotation-Induced Vibrational Mixing in  $\text{X}^+ 1\text{A}1$  Formaldehyde: Non-Negligible Dynamical Consequences of Rotation.  
AD-A161 284  
Reprint: Temperature Dependence of the Vibrational Population Lifetime of  $\text{OH}(\nu=1)$  in Fused Silica.  
AD-A162 700  
Reprint: Picosecond Vibrational Energy Relaxation of Surface Hydroxyl Groups on Colloidal Silica.  
AD-A162 797  
Reprint: Vibrational Deactivation of Surface OH chemisorbed on  $\text{SiO}_2$  sub 2: Solvent Effects.  
AD-A162 803  
Reprint: Vibrational Energy Relaxation of Adsorbates on Surfaces.  
AD-A162 804  
Reprint: Time Resolved Measurements of Vibrational Relaxation of Molecules on Surfaces Hydroxyl Groups on Silica  
AD-A162 899
- \*MONOMERS  
Reprint: State-Resolved Photofragmentation of OCS Monomers and Clusters.  
AD-A162 971
- \*MONOSTATIC RADAR  
Measurement of Horizontal Structures and Wavelengths (5-500 km) in Mesospheric Gravity Waves, Tides and Winds. Workshop and Design Study.\*  
AD-A162 768
- \*MONTE CARLO METHOD  
Reprint: Monte Carlo Transition-State Study of Angular Momentum Effects on the Unimolecular Dissociation of  $\text{CH}_4(4)$  on the Duchovic-Hase-Schegel ab initio Surface.  
AD-A162 218  
Monte Carlo Reliability Analysis.\*  
AD-A162 379  
Computer-Aided Engineering.\*  
AD-A162 811
- \*MORPHOLOGY  
Investigations into the Origins of the Physical Structure of Thin Films.\*  
AD-A162 772
- \*MOUNTAINS  
Reprint: Direct Measurement of Large-Scale Vertical Velocities Using Clear-Air Doppler Radars.  
AD-A162 973
- \*MULTIPROCESSORS  
Reprint: Dynamically Restructurable Fault-Tolerant Processor Network Architectures.  
AD-A161 358  
Reprint: The De Bruijn Multiprocessor Network: A Versatile Sorting Network.  
AD-A161 509
- \*MULTIVARIATE ANALYSIS  
Limiting Spectral Distribution for a Class of Random Matrices.\*  
AD-A161 059  
Optimality Robustness of Tests in Two Population Problems.\*  
AD-A162 265  
On Tests for Selection of Variables and Independence under Multivariate Regression Model.\*  
AD-A162 382
- \*NATURAL LANGUAGE  
Knowledge Representation and Natural-Language Semantics.\*
- AD-A162 389
- \*NEODYMIUM  
Reprint: Electrochemistry in Neutral Ambient-Temperature Ionic Liquids. 1. Studies of Iron (III), Neodymium (III), and Lithium (I).  
AD-A162 077
- \*NEUTRALIZATION  
Reprint: Neutralization and Excitation in Low-Energy Ion-Surface Collisions.  
AD-A163 011
- \*NICKEL ALLOYS  
Understanding the HIP (Hot Isostatic Pressing) Consolidation of P/M Nickel-Base Superalloys.\*  
AD-A162 387
- \*NITRILES  
Reprint: Carbene and Silicon Routes Toward a Simple Nitrile Ylide. Spectroscopic, Kinetic, and Chemical Characterization.  
AD-A162 928
- \*NITRO RADICALS  
Reprint: Thermolysis of Molecules Containing  $\text{NO}_2$  Groups.  
AD-A162 091
- \*NITROGEN OXIDES  
Reprint: Adsorption and Desorption of NO from  $\text{Rh}(111)$  and  $\text{Rh}(331)$  Surfaces.  
AD-A162 831  
Reprint: Reduction of Nitric Oxide on the Carbon Pretreated  $\text{Rh}(331)$  Single Crystal Surface: Evidence for Molecular CN Formation.  
AD-A162 950
- \*NOISE  
On Detection of Number of Signals in Presence of Colored Noise Using Information Theoretic Criteria.\*  
AD-A161 847

SUBJECT INDEX-17  
UNCLASSIFIED EVK551

MON-NOI



# UNCLASSIFIED

- \*NONDESTRUCTIVE TESTING  
Electromagnetic Sensor Arrays  
for Nondestructive Evaluation and  
Robot Control.\*  
AD-A161 292
- \*NONLINEAR ANALYSIS  
Nonlinear Analysis and Optimal  
Design of Dynamic Mechanical  
Systems for Spacecraft  
Application.\*  
AD-A162 194
- Non-Linear Systems in Infinite  
Dimensional State Spaces.\*  
AD-A162 869
- \*NONLINEAR DIFFERENTIAL EQUATIONS  
Reprint: Local Error Estimated  
for Parametrized Nonlinear  
Equations.  
AD-A161 077
- \*NONLINEAR SYSTEMS  
Infrared Nonlinear Processes in  
Semiconductors.\*  
AD-A162 096
- \*NONPARAMETRIC STATISTICS  
Efficiency Loss with the Kaplan-  
Meier Estimator.\*  
AD-A161 341
- \*NORMAL DISTRIBUTION  
Optimality Robustness of Tests  
in Two Population Problems.\*  
AD-A162 265
- \*NOZZLE GAS FLOW  
Reprint: Clustering in Free Jets  
- Aggregation by Dispersion.  
AD-A161 314
- \*NUCLEAR EXPLOSIONS  
Regional Studies with Broadband  
Data.\*  
AD-A161 497
- \*NUCLEAR MAGNETIC RESONANCE  
Reprint: Silicon-29 NMR Studies  
of Polymethylhydrosiloxanes: Spin-  
Lattice Relaxation Time (T(1))
- Measurements.  
AD-A162 992
- \*NUMERICAL ANALYSIS  
Reprint: Numerical Study of  
Quenching of Inward Propagating  
Spherical Flames.  
AD-A162 501
- \*NUMERICAL INTEGRATION  
On Stochastic Integration by  
Series of Wiener Integrals.\*  
AD-A161 514
- \*OPERATORS (MATHEMATICS)  
Some General Probabilistic  
Estimations for the Rate of  
Convergence in Operator Semigroup  
Representations.\*  
AD-A161 359
- \*OPTICAL MATERIALS  
Laser Evaporation Studies.\*  
AD-A162 346
- \*OPTICAL PROCESSING  
Optical Acquisition, Image and  
Data Compression.\*  
AD-A161 650
- \*OPTICAL PROPERTIES  
Nonlinear Optical Phenomena in  
Solids.\*  
AD-A162 394
- \*OPTICAL PUMPING  
Investigation of Rubidium  
Hyperfine Structure Frequency  
Stabilization Mechanisms.\*  
AD-A162 388
- \*OPTICAL WAVEGUIDES  
OM85. Basic Properties of  
Optical Materials Summaries of  
Papers.\*  
AD-A161 247
- \*ORGANIC COMPOUNDS  
Reprint: Kinetics of Thermal Cis-  
Trans Isomerizations in Disilenes.  
AD-A162 350
- Reprint: Unsaturated Reactive  
Intermediates in Organosilicon  
Chemistry - Recent Results.  
AD-A162 917
- \*ORGANIC NITROGEN COMPOUNDS  
Reprint: Thermolysis of  
Molecules Containing N02 Groups.  
AD-A162 091
- \*ORGANIC PHOSPHORUS COMPOUNDS  
Reprint: Phospha-S-Triazines.  
VIII. Chloro-Substituted Diphospha-  
S-Triazines.  
AD-A161 122
- Reprint: Quantum Theoretical  
Determination of the Molecular  
Structure of some  
Anticholinesterase Agents.  
AD-A162 074
- Reprint: The Ab Initio Structure  
of O-Methyl  
Methylphosphonofluoridate.  
AD-A162 817
- \*ORGANIC RADICALS  
Reprint: Nanosecond Flash  
Photolysis Studies of Intersystem  
Crossing Rate Constants in  
Biradicals: Structural Effects  
Brought about by Spin Orbit  
Coupling.  
AD-A162 948
- \*ORGANOMETALLIC COMPOUNDS  
Reprint: Organogermane  
Homopolymers and Copolymers with  
Organosilanes.  
AD-A162 923
- \*OXETANES  
Reprint: Synthesis of a 1,3-  
Dioxo-2,4-diboretane: An Oxoborane  
Precursor.  
AD-A162 497
- Titanium Tetrachloride Promoted  
Reactions of Allylic  
Trimethylsilanes and Oxetane.  
AD-A162 951
- Reprint: Zinc Iodide Catalyzed  
Reaction of Oxetanes with

SUBJECT INDEX-18  
UNCLASSIFIED EVK551

NON-OXE

UNCLASSIFIED

- Trimethylsilyl Cyanide.  
AD-A163 064
- \*OXIDATION  
Reprint: Electrochemical Oxidation of Some Metal Carbonyls in Ambient Temperature Ionic Liquids.  
AD-A161 168  
Reprint: The Role of Intersystem Crossing Steps in Singlet Oxygen Chemistry and Photo-Oxidations.  
AD-A162 310  
Reprint: Organosilane High Polymers: Oxidation of Polycyclohexylmethylsilylene.  
AD-A162 893
- \*OXYGEN  
Reprint: The Role of Intersystem Crossing Steps in Singlet Oxygen Chemistry and Photo-Oxidations.  
AD-A162 310
- \*P TYPE SEMICONDUCTORS  
Infrared Nonlinear Processes in Semiconductors.\*  
AD-A162 096
- \*PARALLEL PROCESSORS  
Associative Networks on a Massively Parallel Computer.\*  
AD-A162 234
- \*PARTIAL DIFFERENTIAL EQUATIONS  
Numerical Solution of 111 Posed Problems in Partial Differential Equations.\*  
AD-A162 378
- \*PARTICLE COLLISIONS  
The Conference on the Dynamics of Molecular Collisions Held at Snowbird, Utah on 14-19 July 1985.\*  
AD-A161 078
- \*PASSIVE SYSTEMS  
Reprint: Passive Fiber-Optic Ring Resonator for Rotation Sensing.  
AD-A162 943
- \*PEPTIDES  
Reprint: Alternative View of Enzyme Reactions.  
AD-A162 198
- \*PHASE TRANSFORMATIONS  
Structure-Property Relationships in Intercalated Graphite.\*  
AD-A162 326
- \*PHENOLS  
Reprint: Multiphoton Ionization Photoelectron Spectroscopy of Phenol: Variational Frequencies and Harmonic Force Field for 2B sub 1 Cation.  
AD-A162 972
- \*PHENYL RADICALS  
Reprint: Singlet-Triplet Interconversion of Diphenylmethylene Energetics, Dynamics and Reactivities of Different Spin States.  
AD-A162 682
- \*PHOSPHONIC ACIDS  
Reprint: Ab Initio Structures of Phosphorus Acids and Esters. 1. Phosphinic, Phosphonic and Phosphoric Acids.  
AD-A161 218
- \*PHOSPHORIC ACIDS  
Reprint: Ab Initio Structures of Phosphorus Acids and Esters. 1. Phosphinic, Phosphonic and Phosphoric Acids.  
AD-A161 218
- \*PHOSPHORUS  
Reprint: Electronic Structure of the Phosphoryl and Thiophosphoryl Bonds.  
AD-A162 809
- \*PHOTOCHEMICAL REACTIONS  
Production and Properties of Metastable Autodetaching Negative Ions.\*  
AD-A161 256
- Reprint: Molecular Mechanics of Photopolymerization of 2,5-Distyrylpyrazine in Solid State.  
AD-A161 317  
Laser-Induced Kinetics: An Experimental and Theoretical Program.\*  
AD-A161 994  
Reprint: The Role of Intersystem Crossing Steps in Singlet Oxygen Chemistry and Photo-Oxidations.  
AD-A162 310  
Reprint: The Dynamics of Barrier Crossings in Solution: The Effect of a Solvent Polarity-Dependent Barrier.  
AD-A162 892  
Reprint: Carbene and Silicon Routes Toward a Simple Nitrile Ylide. Spectroscopic, Kinetic, and Chemical Characterization.  
AD-A162 928
- \*PHOTODIODES  
Study in Spurious Sensitivity of Electronics in Space.\*  
AD-A162 300
- \*PHOTODISSOCIATION  
Reprint: Photodissociation Dynamics of Nozzle-Cooled ICN.  
AD-A161 659  
Reprint: Collisional Deactivation of K(5(2)P(J)) by H(2). Identification of the Primary Quenching Channel.  
AD-A162 903  
Reprint: State-Resolved Photofragmentation of OCS Monomers and Clusters.  
AD-A162 971
- \*PHOTOELECTRON SPECTRA  
Reprint: Multiphoton Ionization Photoelectron Spectroscopy of Phenol: Variational Frequencies and Harmonic Force Field for 2B sub 1 Cation.  
AD-A162 972
- \*PHOTOIONIZATION

SUBJECT INDEX-19  
UNCLASSIFIED EVK551

OXI-PHO

UNCLASSIFIED

- Reprint: Multiphoton Ionization  
Photoelectron Spectroscopy of  
Phenol: Variational Frequencies and  
Harmonic Force Field for 2B sub 1  
Cation.  
AD-A162 972
- Reprint: Recent Advances in the  
Theory of Chemi-Ionization.  
AD-A163 126
- \*PHOTOLYSIS  
Reprint: Photodissociation  
Dynamics of Nozzle-Cooled ICN.  
AD-A161 659  
Reprint: The Observation of  
CIDEF (Chemically Induced Dynamic  
Electron Polarization) from the  
Photodecomposition of Dibenzyl  
Ketone in Micellar Solution.  
AD-A161 660  
Reprint: Nanosecond Flash  
Photolysis Studies of Intersystem  
Crossing Rate Constants in  
Bisradicals: Structural Effects  
Brought about by Spin Orbit  
Coupling.  
AD-A162 948
- \*PHOTOMULTIPLIER TUBES  
Study in Spurious Sensitivity of  
Electronics in Space.\*  
AD-A162 300
- \*PIPERAZINES  
Reprint: Molecular Mechanics of  
Photopolymerization of 2,5-  
Distyrylpyrazine in Solid State.  
AD-A161 317
- \*PLANAR STRUCTURES  
Nonlinear Analysis and Optimal  
Design of Dynamic Mechanical  
Systems for Spacecraft  
Application.\*  
AD-A162 194
- \*PLANNING  
Research on Problem-Solving  
Systems.\*  
AD-A162 095
- \*PLASMA DEVICES  
Mega-Amp Opening Switch with  
Nested Electrodes/Pulsed Generator  
of Ion and Ion Cluster Beams.\*  
AD-A162 850
- \*PLASMAS(PHYSICS)  
Plasma Deposition of Silicon  
Carbide Thin Films.\*  
AD-A161 275
- \*PLATES  
Delamination Buckling and Growth  
of Flat Composite Structural  
Elements.\*  
AD-A162 370
- \*POISSON DENSITY FUNCTIONS  
On the Distance between Mixed  
Poisson and Poisson Distributions.\*  
AD-A161 337  
A Martingale Characterization of  
Mixed Poisson Processes.\*  
AD-A162 957
- \*POLARIZATION  
Reprint: The Observation of  
CIDEF (Chemically Induced Dynamic  
Electron Polarization) from the  
Photodecomposition of Dibenzyl  
Ketone in Micellar Solution.  
AD-A161 660
- \*POLLUTANTS  
Development and Use of  
Amplified Bacterial Cells to Assay  
the in vivo Activity of  
Pollutants.\*  
AD-A162 727
- \*POLYMERIZATION  
Molecular Mechanics of Polymeric  
Interactions.\*  
AD-A161 095  
Reprint: Molecular Mechanics of  
Photopolymerization of 2,5-  
Distyrylpyrazine in Solid State.  
AD-A161 317
- \*POLYMERS  
Molecular Mechanics of Polymeric
- Interactions.\*  
AD-A161 095  
Reprint: Laser Raman  
Investigation of Drug-Polymer  
Conjugates: Sulfathiazole-Povidone  
Copolymer.  
AD-A161 115  
Reprint: Internal Damping of  
Short-Fiber Reinforced Polymer  
Matrix Composites.  
AD-A162 311  
Study of Transport Properties  
and Structure of Extended-Chain  
Polymers.\*  
AD-A162 785  
Study of Transport Properties  
and Structure of Extended-Chain  
Polymers: Diffusion and Solubility  
of Gases.\*  
AD-A162 766  
Reprint: Electron Nuclear Double  
Resonance Spectra of Cis-Rich and  
Trans-Rich Polyacetylenes between  
1.9 and 4.2 K.  
AD-A162 816  
Reprint: Organosilane High  
Polymers: Oxidation of  
Polycyclohexylmethylsilylene.  
AD-A162 893  
Reprint: Electrical and Optical  
Studies of Chemically Synthesized  
Polypyrrole.  
AD-A162 894  
Reprint: (13)C and (1)H Hyperfine  
Tensors for Polyacetylene Analyzed  
in Terms of Pi (-o) Electron  
Coulombic Interactions.  
AD-A162 895  
Reprint: Organogermane  
Homopolymers and Copolymers with  
Organosilanes.  
AD-A162 923  
Reprint: Silicon-29 NMR Studies  
of Polydimethylsiloxanes: Spin-  
Lattice Relaxation Time (T(1))  
Measurements.  
AD-A162 992  
Reprint: Statistical  
Thermodynamics of Semirigid  
Macromolecules: Chains with  
Interconvertible Rodlike and Random-

SUBJECT INDEX-20  
UNCLASSIFIED EVK551

PHO-POL

UNCLASSIFIED

Coil Sequences in Equilibrium.  
AD-A163 125

\*POLYSILANES  
Reprint: Natural Abundance (13C and (29)Si ENDOR Studies of Cyclopolyisilane Radical Anions.  
AD-A162 246

\*POPULATION(MATHEMATICS)  
Optimality Robustness of Tests in Two Population Problems.\*  
AD-A162 265

\*POTASSIUM COMPOUNDS  
Reprint: Collisional Deactivation of K(5(2)P(J)) by H(2). Identification of the Primary Quenching Channel.  
AD-A162 903

\*POWDER ALLOYS  
Understanding the HIP (Hot Isostatic Pressing) Consolidation of P/M Nickel-Base Superalloys.\*  
AD-A162 387

\*PRECIPITATION  
Reprint: Relationship of Precipitation to Vertical Motion Observed Directly by a VHF Wind Profiler during a Spring Upslope Storm Near Denver, Colorado.  
AD-A162 970

\*PROBABILITY DISTRIBUTION FUNCTIONS  
Probabilistic Solution of Inverse Problems.\*  
AD-A161 130  
Random Integral Representations for Classes of Limit Distributions Similar to Levy Class L(0).\*  
AD-A161 413

\*PROBLEM SOLVING  
Probabilistic Solution of Inverse Problems.\*  
AD-A161 130  
Research on Problem-Solving Systems.\*  
AD-A162 095

\*PROFILES  
Reprint: Relationship of Precipitation to Vertical Motion Observed Directly by a VHF Wind Profiler during a Spring Upslope Storm Near Denver, Colorado.  
AD-A162 970

\*PYRIDINES  
Reprint: Charge Transport in Poly-(Ru(2,2'-Bipyridine)2(4-Vinylpyridine)2(3/2) Films in AlCl3/N-(1-Buryl)pyridinium Chloride and AlCl3/1-Methyl(3-Ethyl)imidazolium Chloride Molten Salts.  
AD-A161 228

\*PYROLYSIS  
Laser-Induced Kinetics: An Experimental and Theoretical Program.\*  
AD-A161 994  
Reprint: Thermolysis of Molecules Containing NO2 Groups.  
AD-A162 091

\*PYRROLES  
Reprint: Electrical and Optical Studies of Chemically Synthesized Polypyrrole.  
AD-A162 894

\*QUALITY CONTROL  
Sequential Decision Models in Reliability.\*  
AD-A162 332

\*QUANTUM THEORY  
Reprint: Quantum Mechanical Partitioning of Kinetic Energy in Collision-Induced Dissociation.  
AD-A161 167  
Reprint: Possibility of Observing Quantum Size Effects in the Electromagnetic Absorption Spectrum of Small Metal Particles.  
AD-A161 182

Reprint: Intramolecular Vibrational Dynamics Including Rotational Degrees of Freedom.

Chaos and Quantum Spectra,  
AD-A161 313  
Superlattice Effects in Graphite Intercalation Compounds.\*  
AD-A162 373

Reprint: (13)C and (1)H Hyperfine Tensors for Polyacetylene Analyzed in Terms of pi (-o) Electron Coulombic Interactions.  
AD-A162 895

Reprint: Dynamics and Kinetics on Surfaces Exhibiting Defects.  
AD-A162 908  
Reprint: Quantum Statistical Theory of Vibrational Dynamics in a Laser-Driven Admolecule-Surface System.  
AD-A163 058

\*RADAR MAPPING  
High Frequency Radar Studies of the Very High Latitude Ionosphere.\*  
AD-A162 754

\*RADIANT FLUX DENSITY  
Reprint: Rocket-Borne Measurements of Atmospheric Infrared Fluxes.  
AD-A162 819

\*RADIATION ABSORPTION  
Theoretical Studies of Laser-Induced Molecular Rate Processes: Topics in Line Broadening and Spectroscopy.\*  
AD-A161 132

\*RAINFALL INTENSITY  
Reprint: Relationship of Precipitation to Vertical Motion Observed Directly by a VHF Wind Profiler during a Spring Upslope Storm Near Denver, Colorado.  
AD-A162 970

\*RAMAN SPECTROSCOPY  
Reprint: Laser Raman Investigation of Drug-Polymer Conjugates: Sulfathiazole-Povidone Coprecipitates.  
AD-A161 115

SUBJECT INDEX-21  
UNCLASSIFIED EVK551

POL-RAM

UNCLASSIFIED

Semiconductors Investigated by  
Picosecond Absorption, Fluorescence  
and Raman Time-Resolved  
Spectroscopy.\*  
AD-A162 303

\*RAMJET ENGINES  
Combustor/Inlet Interactions and  
Modeling of Hypersonic Dual  
Combustor Ramjet Engines.\*  
AD-A162 111

\*RANDOM ACCESS COMPUTER STORAGE  
Updating Properties of Directed  
Acyclic Graphs on a Parallel Random  
Access Machine.\*  
AD-A162 954

\*RANDOM VARIABLES  
Existence of Random Variables  
with Values in the Dual of a  
Nuclear Space.\*  
AD-A161 343

Asymptotic Global Behavior for  
Stochastic Approximations and  
Diffusions with Slowly Decreasing  
Noise Effects: Global Minimization  
via Monte Carlo.\*  
AD-A162 333  
Peakedness of Weighted Averages  
of Jointly Distributed Random  
Variables.\*  
AD-A162 876

\*RAYLEIGH WAVES  
Regional Studies with Broadband  
Data.\*  
AD-A161 497

\*REACTION KINETICS  
Reprint: Vibrationally Excited  
CO<sub>2</sub> from the Reaction of O Atoms  
and Adsorbed CO on Platinum.  
AD-A161 219  
Reprint: Singlet-Triplet  
Interconversion of  
Diphenylmethane Energetics,  
Dynamics and Reactivities of  
Different Spin States.  
AD-A162 682  
Reprint: Nanosecond Flash

Photolysis Studies of Intersystem  
Crossing Rate Constants in  
Biradicals: Structural Effects  
Brought about by Spin Orbit  
Coupling.  
AD-A162 948

Reprint: Flowing Afterglow  
Infrared Chemiluminescence Studies  
of Vibrational Energy Disposal in  
the Ion-Molecule Reactions F-  
HBr, DBr Yields HF, DF Br-.  
AD-A162 980

Reprint: Product Vibrational  
State Distributions of Thermal  
Energy Charge Transfer Reactions  
Determined by Laser-Induced  
Fluorescence in a Flowing  
Afterglow: Ar() CO Yields CO()(V=0-  
8) Ar.  
AD-A162 985

\*RECEIVERS  
Spread Spectrum Acquisition and  
Tracking.\*  
AD-A162 442

\*RECOGNITION  
Electromagnetic Sensor Arrays  
for Nondestructive Evaluation and  
Robot Control.\*  
AD-A161 292

\*RECOMBINATION REACTIONS  
Laser-Induced Kinetics: An  
Experimental and Theoretical  
Program.\*  
AD-A161 994

Reprint: Monte Carlo Random Walk  
Study of Recombination and  
Desorption of Hydrogen on Si(111).  
AD-A162 278  
Electron Production, Electron  
Attachment, and Charge  
Recombination Process in High  
Pressure Gas Discharges.\*  
AD-A162 747

\*REDUCTION(CHEMISTRY)  
Reprint: Reduction of Nitric  
Oxide on the Carbon Pretreated  
Rh(331) Single Crystal Surface:

Evidence for Molecular CN -  
Formation.  
AD-A162 950

\*RELAXATION  
Reprint: Vibrational Energy  
Relaxation of Adsorbates on  
Surfaces.  
AD-A162 804

Reprint: Time Resolved  
Measurements of Vibrational  
Relaxation of Molecules on  
Surfaces: Hydroxyl Groups on  
Silica.  
AD-A162 899

\*RELAXATION TIME  
Reprint: Silicon-29 NMR Studies  
of Polymethylhydrosiloxanes: Spin-  
Lattice Relaxation Time (T<sub>1</sub>)  
Measurements.  
AD-A162 992

\*RELIABILITY  
Reliability Assessment for  
Systems Subject to Maintenance and  
Repair.\*  
AD-A162 029  
Monte Carlo Reliability  
Analysis.\*  
AD-A162 379

\*REPAIR  
Reliability Assessment for  
Systems Subject to Maintenance and  
Repair.\*  
AD-A162 029

\*REPORTS  
AFOSR (Air Force Office of  
Scientific Research) Technical  
Report Summaries.\*  
AD-A162 372

\*RESONANCE  
Reprint: Multiple Resonances in  
Non-Franck-Condon Transitions due  
to Nonlocal Effects in Laser-  
Induced Associative Ionization.  
AD-A161 316

UNCLASSIFIED  
SUBJECT INDEX-22  
EVK551

RAM-RES

UNCLASSIFIED

- \*RESONATORS  
Analytical Investigations of Bulk Wave Resonators in the Piezoelectric Thin Film on Gallium-Arsenide Configuration.\*  
AD-A162 088  
Reprint: Passive Fiber-Optic Ring Resonator for Rotation Sensing.  
AD-A162 943
- \*RHENIUM ALLOYS  
Investigation of Material Problems for High Temperature, High Power Space Energy-Conversion Systems.\*  
AD-A162 227
- \*ROBOTS  
Electromagnetic Sensor Arrays for Nondestructive Evaluation and Robot Control.\*  
AD-A161 292
- \*ROTORS  
Rotordynamic Forces Developed by Labyrinth Seals.\*  
AD-A162 160
- \*RUBBER  
Reprint: Network Topology and the Theory of Rubber Elasticity.  
AD-A162 829  
Reprint: Molecular Theory of Rubber Elasticity.  
AD-A162 852
- \*SALTS  
Reprint: Nonlinear Electroacoustic Phenomena: Phono Echo in d-Tartaric Acid and Its Salts.  
AD-A161 140
- \*SCALING FACTORS  
Reprint: Scaling of Nonlocal Operators.  
AD-A162 929
- \*SCATTERING  
The Conference on the Dynamics of Molecular Collisions Held at Snowbird, Utah on 14-19 July 1985.\*  
AD-A161 078
- \*SEALS(STOPPERS)  
Rotordynamic Forces Developed by Labyrinth Seals.\*  
AD-A162 160
- \*SEISMIC DATA  
Reprint: The Shur Algorithm and Its Applications.  
AD-A161 011  
Regional Studies with Broadband Data.\*  
AD-A161 497
- \*SEISMOGRAPHS  
Analysis of MSS (Marine Seismic System) and OBS (Ocean Bottom Seismograph) Data Collected during the NGNDEI Seismic Experiment.\*  
AD-A162 354
- \*SEMANTICS  
Knowledge Representation and Natural-Language Semantics.\*  
AD-A162 389
- \*SEMICONDUCTOR DEVICES  
Microwave Semiconductor Research Materials, Devices and Circuits.\*  
AD-A162 021
- \*SEMICONDUCTOR LASERS  
Semiconductors Investigated by Picosecond Absorption, Fluorescence and Raman Time-Resolved Spectroscopy.\*  
AD-A162 303
- \*SEMICONDUCTORS  
Clustering and Ordering in III-V Alloys.\*  
AD-A161 099  
Reprint: Electrical and Optical Studies of Chemically Synthesized Polypyrrole.  
AD-A162 894
- \*SEQUENCES  
Spread Spectrum Acquisition and Tracking.\*  
AD-A162 442
- \*SEQUENCES(MATHEMATICS)  
Innovations and Mold Decompositions of Stable Sequences.\*  
AD-A161 437
- \*SET THEORY  
Finding Critical Sets.\*  
AD-A161 388
- \*SHAPE  
Optical Acquisition, Image and Data Compression.\*  
AD-A161 850
- \*SHEAR PROPERTIES  
Regional Studies with Broadband Data.\*  
AD-A161 497  
Reprint: Adaptive Finite Element Methods and the Numerical Solution of Shear Band Problems.  
AD-A162 208
- \*SHELLS(STRUCTURAL FORMS)  
Buckling of Delaminated Shells and Multi-Annular Plates.\*  
AD-A162 371
- \*SIGNAL PROCESSING  
Reprint: The Shur Algorithm and Its Applications.  
AD-A161 011
- \*SIGNAL TO NOISE RATIO  
Effects of Estimated Noise Covariance Matrix in Optimal Signal Detection.\*  
AD-A162 796
- \*SIGNALS  
On Detection of Number of Signals in Presence of Colored Noise Using Information Theoretic Criteria.\*  
AD-A161 847
- \*SEQUENCES

SUBJECT INDEX-23  
UNCLASSIFIED EVK551

RES-SIG

# UNCLASSIFIED

\*SILANES  
Reprint: Adamantylidimethylsilyl  
Ethers.  
AD-A162 073  
Reprint: Organosilane High  
Polymers: Oxidation of  
Polycyclohexylmethylsilylene.  
AD-A162 893  
Reprint: Factors Influencing the  
Magnitude of Alpha-13C Hyperfine  
Couplings in Cyclosilane Anion  
Radicals.  
AD-A162 908  
Reprint: Organosilane Polymers:  
Formable Copolymers Containing  
Diphenylsilylene Units.  
AD-A162 907  
Reprint: ESR (Electron Spin  
Resonance) Spectra for Anion  
Radicals of Alkylcyclooctasilanes  
and Cyclopentasilanes.  
AD-A162 919  
Titanium Tetrachloride Promoted  
Reactions of Allylic  
Trimethylsilyl silanes and Oxetane.  
AD-A162 951  
Reprint: Convenient Syntheses of  
Dodecamethylcyclohexasilane and  
Decamethylcyclopentasilane.  
AD-A163 123

\*SILICON  
Theoretical Investigations of  
the CVD (Chemical Vapor Deposition)  
of Silicon from Silane.\*  
AD-A162 548

\*SILICON CARBIDES  
Plasma Deposition of Silicon  
Carbide Thin Films.\*  
AD-A161 275

\*SILICON COMPOUNDS  
Reprint: Kinetics of Thermal Cis-  
Trans Isomerizations in Disilenes.  
AD-A162 350  
Reprint: Unsaturated Reactive  
Intermediates in Organosilicon  
Chemistry - Recent Results.  
AD-A162 917  
Reprint: The Intrinsic Reaction

Coordinate and the Rotational  
Barrier in Silaethylene.  
AD-A162 922

\*SILICON DIOXIDE  
Reprint: Picosecond Vibrational  
Energy Relaxation of Surface  
Hydroxyl Groups on Colloidal  
Silica.  
AD-A162 797

\*SILICON NITRIDES  
Silicon Nitride Joining.\*  
AD-A162 337

\*SILOXANES  
Reprint: Silicon-29 NMR Studies  
of Polymethylhydrosiloxanes: Spin-  
Lattice Relaxation Time (T(1))  
Measurements.  
AD-A162 992

\*SOIL MECHANICS  
Three-Dimensional Elasto-Plastic  
Analysis for Soils.\*  
AD-A162 063  
Generalized Phenomenological  
Cyclic Stress-Strain-Strength  
Characterization of Anisotropic  
Granular Media.\*  
AD-A162 348

\*SOIL MODELS  
Three-Dimensional Elasto-Plastic  
Analysis for Soils.\*  
AD-A162 063

\*SOLAR CELLS  
Reprint: Organic-Thin-Film-  
Coated Solar Cells: Energy Transfer  
between Surface Pyrene Molecules  
and the Silicon Semiconductor  
Substrate.  
AD-A161 151

\*SOLID ROCKET PROPELLANTS  
Prediction of Detonation  
Transition in Porous Explosives  
from Rapid Compression Loadings.\*  
AD-A162 767

\*SOLUBILITY  
Study of Transport Properties  
and Structure of Extended-Chain  
Polymers: Diffusion and Solubility  
of Gases.\*  
AD-A162 788

\*SOLUTIONS(GENERAL)  
On an Estimate for the Three-  
Grid MGR Multigrid Method.\*  
AD-A161 098

\*SOLVENTS  
Reprint: The Dynamics of Barrier  
Crossings in Solution: The Effect  
of a Solvent Polarity-Dependent  
Barrier.  
AD-A162 892

\*SORTING  
Reprint: The De Bruijn  
Multiprocessor Network: A Versatile  
Sorting Network.  
AD-A161 509

\*SPACE SYSTEMS  
Exploration of the Maximum  
Entropy/Optimal Projection Approach  
to Control Design Synthesis for  
Large Space Structures.\*  
AD-A161 355

\*SPACECRAFT  
A Model for Predicting  
Thermomechanical Response of Large  
Space Structures.\*  
AD-A162 139

\*SPACECRAFT COMPONENTS  
Development of Spacecraft  
Materials and Structures  
Fundamentals.\*  
AD-A161 338  
Investigation of Material  
Problems for High Temperature, High  
Power Space Energy-Conversion  
Systems.\*  
AD-A162 227  
Wave Measurements on Truss  
Model.\*  
AD-A162 433

SUBJECT INDEX-24  
UNCLASSIFIED EVK551

SIL-SPA

UNCLASSIFIED

- \*SPARK GAPS  
The Influence of Fluid Mechanics on the Behavior of Gas-Blown Spark Gap Switches. \*  
AD-A161 298
- \*SPECIFICATIONS  
Specification for MIDAS-GR. Management of Information for Design and Analysis of System. Generalized Relational Model. \*  
AD-A162 086
- \*SPECTRAL LINES  
Investigation of Rubidium Hyperfine Structure Frequency Stabilization Mechanisms. \*  
AD-A162 388
- \*SPIN STATES  
Reprint: Singlet-Triplet Interconversion of Diphenylmethylenes Energetics. Dynamics and Reactivities of Different Spin States.  
AD-A162 682  
Reprint: (13)C and (1)H Hyperfine Tensors for Polyacetylene Analyzed in Terms of PI (-o) Electron Coulombic Interactions.  
AD-A162 895
- \*SPREAD SPECTRUM  
Spread Spectrum Acquisition and Tracking. \*  
AD-A162 442
- \*STABILITY  
Innovations and Mold Decompositions of Stable Sequences. \*  
AD-A161 437  
Reprint: Convenient Stability Criteria for Difference Approximations of Hyperbolic Initial-Boundary Value Problems.  
AD-A162 264
- \*STATISTICAL ANALYSIS  
Reprint: Measures of Dependence.  
AD-A162 298
- \*STATISTICAL DISTRIBUTIONS  
Reprint: Goodness-of-Fit Tests for the Weibull Distribution with Unknown Parameters and Heavy Censoring.  
AD-A161 406
- \*STATISTICAL INFERENCE  
Inference for Thinned Point Processes, \*  
AD-A161 328
- \*STATISTICAL TESTS  
Reprint: Goodness-of-Fit Tests for the Weibull Distribution with Unknown Parameters and Heavy Censoring.  
AD-A161 406  
On Tests for Selection of Variables and Independence under Multivariate Regression Model. \*  
AD-A162 382
- \*STATISTICS  
Reprint: Quantum Statistical Theory of Vibrational Dynamics in a Laser-Driven Admolecule-Surface System.  
AD-A163 058
- \*STOCHASTIC CONTROL  
Nearly Optimal State Feedback Controls for Stochastic Systems with Wideband Noise Disturbances. \*  
AD-A162 271
- \*STOCHASTIC PROCESSES  
A Final Technical Report of Research on under Grant AFOSR-82-0135. \*  
AD-A161 334  
Research in Stochastic Processes. \*  
AD-A162 393  
Extrema and Level Crossings of x(2) Processes. \*  
AD-A162 398  
Product Stochastic Measures. \*  
AD-A162 833
- \*STORMS  
Reprint: Relationship of Precipitation to Vertical Motion Observed Directly by a VHF Wind Profiler during a Spring Upslope Storm Near Denver, Colorado.  
AD-A162 970
- \*STRESS STRAIN RELATIONS  
Generalized Phenomenological Cyclic Stress-Strain-Strength Characterization of Anisotropic Granular Media. \*  
AD-A162 348
- \*SUCCINIC ACID  
Reprint: Nonlinear Electroacoustic Phenomena: Phono Echo in d-Tartaric Acid and Its Salts.  
AD-A161 140
- \*SUCCINIMIDES  
Reprint: MNDO Study of Ring Opening in the Succinimidy Radical.  
AD-A162 150
- \*SULFONAMIDES  
Reprint: Polyaromatic Ether-Ketones and Polyaromatic Ether-Ketone Sulfonamides from 4-Phenoxybenzoyl Chloride and from 4,4'-Dichloroformylidiphenyl Ether.  
AD-A161 265
- \*SULFUR  
Reprint: Electronic Structure of the Phosphoryl and Thiophosphoryl Bonds.  
AD-A162 809
- \*SUPERALLOYS  
Understanding the HIP (Hot Isostatic Pressing) Consolidation of P/M Nickel-Base Superalloys. \*  
AD-A162 387
- \*SUPERCONDUCTORS  
Structure-Property Relationships in Intercalated Graphite. \*

SUBJECT INDEX-25  
UNCLASSIFIED EVK551

SPA-SUP



## UNCLASSIFIED

- AD-A162 326  
Superlattice Effects in Graphite  
Intercalation Compounds.\*  
AD-A162 373
- \*SUPERFLUIDITY  
A New Process for Final  
Densification of Ceramics.\*  
AD-B096 961L
- \*SUPERSONIC COMBUSTION  
Combustor/Inlet Interactions and  
Modeling of Hypersonic Dual  
Combustor Ramjet Engines.\*  
AD-A162 111
- \*SURFACE CHEMISTRY  
Re-Evaluation of Surface  
Properties of Oxide-Cathode  
Materials.\*  
AD-A161 131  
Reprint: Surface Bonding of the  
NH<sub>3</sub> and NH<sub>2</sub> Species to Ni(110).  
AD-A162 270  
Reprint: Monte Carlo Random Walk  
Study of Recombination and  
Desorption of Hydrogen on Si(111).  
AD-A162 278  
Theoretical Investigations of  
the CVD (Chemical Vapor Deposition)  
of Silicon from Silane.\*  
AD-A162 548  
Reprint: Picosecond Vibrational  
Energy Relaxation of Surface  
Hydroxyl Groups on Colloidal  
Silica.  
AD-A162 797  
Reprint: Time Resolved  
Measurements of Vibrational  
Relaxation of Molecules on  
Surfaces: Hydroxyl Groups on  
Silica.  
AD-A162 899  
Reprint: Dynamics and Kinetics  
on Surfaces Exhibiting Defects.  
AD-A162 908  
Reprint: Reduction of Nitric  
Oxide on the Carbon Pretreated  
Rh(331) Single Crystal Surface:  
Evidence for Molecular CN -  
Formation.
- AD-A162 950  
\*SURFACE WAVES  
Regional Studies with Broadband  
Data.\*  
AD-A161 497
- \*SYMBOLIC PROGRAMMING  
Transient Solution of Acyclic  
Markov Chains.\*  
AD-A162 314
- \*SYMMETRY  
Reprint: Scaling of Nonlocal  
Operators.  
AD-A162 929
- \*SYNTHESIS(CHEMISTRY)  
Reprint: Phospha-S-Triazines.  
VIII. Chloro-Substituted Diphospha-  
S-Triazines.  
AD-A161 122  
New Approaches to the Synthesis  
of Fluorocarbons.\*  
AD-A162 020  
Reprint: Synthesis of a 1,3-  
Dioxo-2,4-diborethane: An Oxoborane  
Precursor.  
AD-A162 497  
Reprint: Cluster Complex  
Metathesis. Synthesis, Structures,  
and Dynamic Behaviour of Bi- and  
Tri-metallic Hexanuclear Cluster  
Complexes (MM'Ru<sub>4</sub>(μ<sub>3</sub>Im<sub>3</sub>Cr<sub>3</sub>-  
H<sub>2</sub>(CO)<sub>12</sub>(PPh<sub>3</sub>)<sub>2</sub>) (M = M' = Cu,  
Ag, or Au; M = Cu, M' = Ag or Au;  
M = Ag, M = Au.  
AD-A162 873  
Reprint: Convenient Syntheses of  
Dodecamethylcyclohexasilane und  
Decamethylcyclopentasilane.  
AD-A163 123
- \*SYSTEMS ENGINEERING  
Robust Adaptive Control.\*  
AD-A161 349  
Specification for MIDAS-GR.  
Management of Information for  
Design and Analysis of System.  
Generalized Relational Model.\*  
AD-A162 088
- AD-A162 811  
Research on Problem-Solving  
Systems.\*  
AD-A162 095  
Database Design for Structural  
Analysis and Design Optimization.\*  
AD-A162 355  
Computer-Aided Engineering.\*  
AD-A162 811
- \*TENSORS  
Reprint: (13)C and (1)H Hyperfine  
Tensors for Polyacetylene Analyzed  
in Terms of π (-o) Electron  
Coulombic Interactions.  
AD-A162 895
- \*THERMAL CYCLING TESTS  
A Model for Predicting  
Thermomechanical Response of Large  
Space Structures.\*  
AD-A162 139
- \*THERMAL JOINING  
Silicon Nitride Joining.\*  
AD-A162 337
- \*THERMOMECHANICS  
A Model for Predicting  
Thermomechanical Response of Large  
Space Structures.\*  
AD-A162 139  
A Model for Predicting  
Thermomechanical Response of Large  
Space Structures.\*  
AD-A162 140
- \*THIN FILMS  
Reprint: Organic-Thin-Film-  
Coated Solar Cells: Energy Transfer  
between Surface Pyrene Molecules  
and the Silicon Semiconductor  
Substrate.  
AD-A161 151  
Plasma Deposition of Silicon  
Carbide Thin Films.\*  
AD-A161 275  
Laser Evaporation Studies.\*  
AD-A162 348  
Investigations into the Origins  
of the Physical Structure of Thin  
Films.\*

SUBJECT INDEX-26  
UNCLASSIFIED EVK551

SUP-THI

# UNCLASSIFIED

- AD-A162 772  
 \*THREE DIMENSIONAL FLOW  
 A Zonal Approach to the Design  
 of Finite Element Grids for 3-D  
 transonic Flows with Complex  
 Geometries.\*  
 AD-A162 168
- \*THUNDERSTORMS  
 Reprint: Transverse Ageostrophic  
 Circulations Associated with  
 Elevated Mixed Layers.  
 AD-A163 063
- \*TIME LAG THEORY  
 Control and Identification of  
 Time Varying Systems.\*  
 AD-A162 336
- \*TITANIUM ALLOYS  
 Ordered Carbon - Metal Alloys  
 for Extraterrestrial Power  
 Systems.\*  
 AD-A162 287
- \*TOPOLOGY  
 Reprint: Network Topology and  
 the Theory of Rubber Elasticity.  
 AD-A162 829
- \*TOUGHNESS  
 Analysis and Experiments on  
 Interlaminar Fracture Toughness in  
 Resin Matrix Composites.\*  
 AD-A162 689
- \*TRACKING  
 Spread Spectrum Acquisition and  
 Tracking.\*  
 AD-A162 442
- \*TRANSFORMATIONS(MATHEMATICS)  
 Optical Acquisition, Image and  
 Data Compression.\*  
 AD-A161 650  
 Reprint: Transformations which  
 Preserve Convexity.  
 AD-A162 681
- \*TRANSMITTANCE
- Measurement of Atmospheric  
 Transmission Over Long Paths in the  
 Infrared Spectral Region.\*  
 AD-A161 258
- \*TRANSONIC FLOW  
 A Zonal Approach to the Design  
 of Finite Element Grids for 3-D  
 transonic Flows with Complex  
 Geometries.\*  
 AD-A162 168  
 Coupling Linearized Far-Field  
 Boundary Conditions with Nonlinear  
 Near-Field Solutions in Transonic  
 Flow.\*  
 AD-A162 334
- \*TRANSPORT PROPERTIES  
 Study of Transport Properties  
 and Structure of Extended-Chain  
 Polymers.\*  
 AD-A162 765
- \*TRIAxIAL STRESSES  
 Generalized Phenomenological  
 Cyclic Stress-Strain-Strength  
 Characterization of Anisotropic  
 Granular Media.\*  
 AD-A162 348
- \*TRIAZINES  
 Reprint: Phospha-S-Triazines.  
 VIII. Chloro-Substituted Diphospha-  
 S-Triazines.  
 AD-A161 122
- \*TROPOPAUSE  
 Reprint: Doppler Radar  
 Measurements of Turbulence in the  
 Clear Air.  
 AD-A162 991
- \*TRUSSES  
 Wave Measurements on Truss  
 Model.\*  
 AD-A162 433
- \*TUNGSTEN ALLOYS  
 Investigation of Material  
 Problems for High Temperature, High  
 Power Space Energy-Conversion
- Systems.\*  
 AD-A162 227
- \*TURBINE COMPONENTS  
 Research on Aero-Thermodynamic  
 Distortion Induced Structural  
 Dynamic Response of Multi-Stage  
 Compressor Blading.\*  
 AD-A162 432
- \*TURBULENCE  
 Reprint: Doppler Radar  
 Measurements of Turbulence in the  
 Clear Air.  
 AD-A162 991
- \*TURBULENT BOUNDARY LAYER  
 Numerical Simulation of Unsteady  
 Three-Dimensional Turbulent  
 Structures in Boundary Layer  
 Flows.\*  
 AD-A162 130
- \*TURBULENT FLOW  
 Numerical Simulation of Unsteady  
 Three-Dimensional Turbulent  
 Structures in Boundary Layer  
 Flows.\*  
 AD-A162 130
- \*UPPER ATMOSPHERE  
 Reprint: Ground-Based  
 Atmospheric Infrared and Visible  
 Emission Measurements.  
 AD-A162 930
- \*VAPOR DEPOSITION  
 Laser Evaporation Studies.\*  
 AD-A162 346  
 Theoretical Investigations of  
 the CVD (Chemical Vapor Deposition)  
 of Silicon from Silane.\*  
 AD-A162 548
- \*VARIABLES  
 Effect of Additional Variables  
 in Principal Component Analysis.  
 Discriminant Analysis and Canonical  
 Correlation Analysis.\*  
 AD-A162 089

SUBJECT INDEX-27  
 UNCLASSIFIED EVK551

THR-VAR

UNCLASSIFIED

\*VARIATIONAL METHODS

On a Variational Approach to  
Some Parameter Estimation  
Problems.\*

AD-A161 114

\*VIBRATION

Nonlinear Analysis and Optimal  
Design of Dynamic Mechanical  
Systems for Spacecraft  
Application.\*

AD-A162 194

Study of Characteristics of Dry  
Friction Damping.\*

AD-A162 770

\*VIBRATIONAL SPECTRA

Reprint: Multiphoton Ionization  
Photoelectron Spectroscopy of  
Phenol: Variational Frequencies and  
Harmonic Force Field for 2B sub 1  
Cation.

AD-A162 972

\*WAFERS

Analytical Investigations of  
Bulk Wave Resonators in the  
Piezoelectric Thin Film on Gallium-  
Arsenide Configuration.\*

AD-A162 088

\*WAVE PACKETS

Reprint: Semiclassical Wave  
Packet Studies of Elastic and  
Inelastic Atom-Surface Scattering  
from a 3D Model Surface.

AD-A162 692

\*WIND

Measurement of Horizontal  
Structures and Wavelengths (5-500  
km) in Mesospheric Gravity Waves,  
Tides and Winds. Workshop and  
Design Study.\*

AD-A162 768

Reprint: Evidence for Coexisting  
Spectra of Stratified Turbulence  
and Internal Waves in Mesoscale  
Atmospheric Velocity Fields.

AD-A162 840

Reprint: Relationship of

Precipitation to Vertical Motion  
Observed Directly by a VHF Wind  
Profiler during a Spring Upslope  
Storm Near Denver, Colorado.

AD-A162 970

Reprint: Doppler Radar  
Measurements of Turbulence in the  
Clear Air.

AD-A162 991

\*WIND VELOCITY

Reprint: Doppler Radar  
Measurements of Turbulence in the  
Clear Air.

AD-A162 991

\*WING TIPS

Optimization of Tip Store  
Modeling.\*

AD-A162 118

\*ZINC

Reprint: Zinc Iodide Catalyzed  
Reaction of Oxetanes with  
Trimethylsilyl Cyanide.

AD-A163 084

SUBJECT INDEX-28  
UNCLASSIFIED EVK551

VAR-ZIN

# PERSONAL AUTHOR INDEX

## UNCLASSIFIED

## PERSONAL AUTHOR INDEX

- \*ADAMS, GENE W. \* \* \*  
Measurement of Horizontal Structures and Wavelengths (5-500 km) in Mesospheric Gravity Waves, Tides and Winds. Workshop and Design Study.  
AD-A182 788
- \*ADLER, ROBERT J. \* \* \*  
Theory and Applications of Random Fields.  
AD-A182 277
- \* \* \*  
Extrema and Level Crossings of  $x(2)$  Processes.  
AD-A182 398
- \*AGGARWAL, R. L. \* \* \*  
Infrared Nonlinear Processes in Semiconductors.  
AD-A182 098
- \*AHO, MICHAEL \* \* \*  
Goodness-of-Fit Tests for the Weibull Distribution with Unknown Parameters and Heavy Censoring.  
AD-A181 408
- \*ALEX, M. \* \* \*  
A Program of Research on Microfabrication Techniques for VLSI Magnetic Devices.  
AD-A181 271
- \*ALFANO, ROBERT R. \* \* \*  
Semiconductors Investigated by Picosecond Absorption, Fluorescence and Raman Time-Resolved Spectroscopy.  
AD-A182 303
- \*ALLEN, D. H. \* \* \*  
A Model for Predicting Thermomechanical Response of Large Space Structures.  
AD-A182 139
- \* \* \*  
A Model for Predicting Thermomechanical Response of Large Space Structures.  
AD-A182 140
- \*ALSTER, JACK \* \* \*  
Thermolysis of Molecules Containing NO<sub>2</sub> Groups.  
AD-A182 091
- \*ALVEY, M. D. \* \* \*  
Surface Bonding of the NH<sub>3</sub> and NH<sub>2</sub> Species to Ni(110).  
AD-A182 270
- \*ANDERSON, SCOTT L. \* \* \*  
Multiphoton Ionization Photoelectron Spectroscopy of Phenol: Vibrational Frequencies and Harmonic Force Field for the 2B sub 1 Cation.  
AD-A182 972
- \*ARCH, DAVID K. \* \* \*  
Nonlinear Optical Phenomena in Solids.  
AD-A182 394
- \*ARMANIOS, ERIAN A. \* \* \*  
Analysis and Experiments on Interlaminar Fracture Toughness in Resin Matrix Composites.  
AD-A182 889
- \*ARONOWICH, MICHAEL \* \* \*  
Extrema and Level Crossings of  $x(2)$  Processes.  
AD-A182 398
- \*ARORA, J. S. \* \* \*  
Specification for MIDAS-GR.
- Management of Information for Design and Analysis of System. Generalized Relational Model.  
AD-A182 086
- \* \* \*  
Database Design Methodology and Database Management System for Computer-Aided Structural Design Optimization.  
AD-A182 101
- \* \* \*  
Database Design for Structural Analysis and Design Optimization.  
AD-A182 355
- \*ARTMAN, J. \* \* \*  
A Program of Research on Microfabrication Techniques for VLSI Magnetic Devices.  
AD-A181 271
- \*AULD, B. A. \* \* \*  
Electromagnetic Sensor Arrays for Nondestructive Evaluation and Robot Control.  
AD-A181 292
- \*AWERBUCH, JONATHAN \* \* \*  
Fracture Behavior of Boron Aluminum Composites at Room and Elevated Temperatures.  
AD-A182 352
- \*BABAROGIC, ZORAN \* \* \*  
The Dynamics of Barrier Crossings in Solution: The Effect of a Solvent Polarity-Dependent Barrier.  
AD-A182 892
- \*BAI, Z. D. \* \* \*  
On Detection of Number of Signals in Presence of Colored Noise Using Information Theoretic Criteria.  
AD-A181 847
- \*BAIN, LEE J.

PERSONAL AUTHOR INDEX-1  
UNCLASSIFIED EVK551

UNCLASSIFIED

- \* \* \*  
Goodness-of-Fit Tests for the Weibull Distribution with Unknown Parameters and Heavy Censoring.  
AD-A161 406
- \*BAKER, D. J. \* \* \*  
Ground-Based Atmospheric Infrared and Visible Emission Measurements.  
AD-A162 930
- \*BAKER, K. D. \* \* \*  
Rocket-Borne Measurements of Atmospheric Infrared Fluxes.  
AD-A162 819
- \*BALLANTYNE, J. M. \* \* \*  
Microwave Semiconductor Research Materials, Devices and Circuits.  
AD-A162 021
- \*BANKS, H. T. \* \* \*  
On a Variational Approach to Some Parameter Estimation Problems.  
AD-A161 114
- \*BARKER, R. EDWARD, JR. \* \* \*  
Study of Transport Properties and Structure of Extended-Chain Polymers.  
AD-A162 785
- \* \* \*  
Study of Transport Properties and Structure of Extended-Chain Polymers: Diffusion and Solubility of Gases.  
AD-A162 766
- \*BAR-SHALOM, Y. \* \* \*  
Dual Control and Prevention of the Turn-off Phenomenon in a Class of Mimo Systems.  
AD-A161 589
- \*BASS, JOHN C. \* \* \*  
Variable Band Gap Materials for Thermophotovoltaic Generators.  
AD-A161 987
- \*BAUER, L. \* \* \*  
A Program of Research on Microfabrication Techniques for VLSI Magnetic Devices.  
AD-A161 271
- \*BAXTER, LAURENCE A. \* \* \*  
Continuum Structure Functions.  
AD-A162 353
- \*BERGER, M. S. \* \* \*  
Final Report on Air Force Research Grant AFOSR-84-0059.  
AD-A162 827
- \*BERI, A. C. \* \* \*  
Theory of Laser-Stimulated Surface Processes. II. A Generalized-Master-Equation Approach to Energy Transfer between an IR Laser, an Adspecies, and Phonons.  
AD-A163 010
- \*BERNSTEIN, DENNIS S. \* \* \*  
Exploration of the Maximum Entropy/Optimal Projection Approach to Control Design Synthesis for Large Space Structures.  
AD-A161 355
- \*BERTRAND, GUY \* \* \*  
Unsaturated Reactive Intermediates in Organosilicon Chemistry - Recent Results.  
AD-A162 917
- \*BHATTI, M. A. \* \* \*  
Database Management in Design Optimization.
- AD-A162 212  
\*BICE, CHARLES \* \* \*  
Investigation of Material Problems for High Temperature, High Power Space Energy-Conversion Systems.  
AD-A162 227
- \*BIERBAUM, VERONICA M. \* \* \*  
Flowing Afterglow Infrared Chemiluminescence Studies of Vibrational Energy Disposal in the Ion-Molecule Reactions F- + HBr, DBr Yields HF, DF + Br-.  
AD-A162 980
- \* \* \*  
Product Vibrational State Distributions of Thermal Energy Charge Transfer Reactions Determined by Laser-Induced Fluorescence in a Flowing Afterglow: Ar(+) + CO Yields CO(+) (V=0-6) + Ar.  
AD-A162 985
- \*BIERMANN, ALAN W. \* \* \*  
Automatic Programming: A Tutorial on Formal Methodologies.  
AD-A162 207
- \* \* \*  
The Correction of Ill-Formed Input Using History-Based Expectation with Applications to Speech Understanding.  
AD-A162 222
- \*BILLIG, FREDERICK S. \* \* \*  
Combustor/Inlet Interactions and Modeling of Hypersonic Dual Combustor Ramjet Engines.  
AD-A162 111
- \*BLANDFORD, GEORGE E. \* \* \*  
Three-Dimensional Elasto-Plastic Analysis for Soils.  
AD-A162 063

PERSONAL AUTHOR INDEX-2  
UNCLASSIFIED EVK551

BAK-BLA

# UNCLASSIFIED

- \*BLEVINS, CREED E. \* \* \*  
Passively Damped Joints for  
Advanced Space Structures.  
AD-A162 257
- \*BLINKA, THOMAS A. \* \* \*  
Convenient Syntheses of  
Dodecamethylcyclohexasilane and  
Decamethylcyclopentasilane.  
AD-A163 123
- \*BOLAND, PHILIP J. \* \* \*  
Moment and Geometric Probability  
Inequalities Arising from  
Arrangement Increasing Functions.  
AD-A161 273
- \* \* \*  
Fault Diversity in Software  
Reliability.  
AD-A162 757
- \*BOLTON, BARBARA A. \* \* \*  
Laser Raman Investigation of Drug-  
Polymer Conjugates: Sulfathiazole-  
Povidone Coprecipitates.  
AD-A161 115
- \*BOYLES, R. A. \* \* \*  
Inconsistency of the Maximum  
Likelihood Estimator of a  
Distribution Having Increasing  
Failure Rate Average.  
AD-A162 199
- \*BOZACK, M. J. \* \* \*  
Plasma Deposition of Silicon  
Carbide Thin Films.  
AD-A161 275
- \*BRADLEY, RICHARD C. \* \* \*  
Invariance Principles Under a Two-  
Part Mixing Assumption.  
AD-A162 800
- \*BRESCH, JAMES F. \* \* \*  
Vertical Interpolation of  
Meteorological Variables in Low-  
Resolution Numerical Models.  
AD-A162 818
- \*BROWN, MARK \* \* \*  
Reliability Assessment for Systems  
Subject to Maintenance and Repair.  
AD-A162 029
- \*BURAK, I. \* \* \*  
State-Resolved Photofragmentation  
of OCS Monomers and Clusters.  
AD-A162 971
- \*BURGT, LAMBERTUS J. VAN DE \* \* \*  
Laser Induced Fluorescence Study of  
the HeBr<sub>2</sub> Van Der Waals Complex.  
AD-A162 981
- \* \* \*  
The A' 3P1(2 sub u)-X 1 Sigma (+)  
sub g Emission Spectrum of Br<sub>2</sub> in  
an Argon Matrix.  
AD-A163 111
- \*BURTON, DONALD J. \* \* \*  
New Approaches to the Synthesis of  
Fluorocarbons.  
AD-A162 020
- \*CALAHAN, D. A. \* \* \*  
An Analysis and Simulation of the  
CRAY X-MP Memory System.  
AD-A162 769
- \*CAMBANIS, S. \* \* \*  
On Prediction of Harmonizable  
Stable Processes.  
AD-A161 412
- \*CAMBANIS, STAMATIS \* \* \*  
Innovations and Wold Decompositions
- of Stable Sequences.  
AD-A161 437
- \*CAMPBELL, R. \* \* \*  
A Program of Research on  
Microfabrication Techniques for  
VLSI Magnetic Devices.  
AD-A161 271
- \*CARLSON, TOBY N. \* \* \*  
Transverse Ageostrophic  
Circulations Associated with  
Elevated Mixed Layers.  
AD-A163 063
- \*CARPER, HERBERT J., JR \* \* \*  
The Influence of Fluid Mechanics on  
the Behavior of Gas-Blown Spark Gap  
Switches.  
AD-A161 298
- \*CARR, STEVE A. \* \* \*  
Titanium Tetrachloride Promoted  
Reactions of Allylic  
Trimethylsilanes and Oxetane.  
AD-A162 951
- \* \* \*  
Zinc Iodide Catalyzed Reaction of  
Oxetanes with Trimethylsilyl  
Cyanide.  
AD-A163 064
- \*CARROLL, R. J. \* \* \*  
A Stochastic Population Model for  
Managing the Atlantic Menhaden  
(Brevoortia tyrannus) Fishery and  
Assessing Managerial Risks.  
AD-A162 112
- \*CARROLL, RAYMOND J. \* \* \*  
A Note on Levene's Tests for  
Equality of Variances.  
AD-A161 377
- \* \* \*  
Research in Stochastic Processes.

PERSONAL AUTHOR INDEX-3  
UNCLASSIFIED  
EVK551

BLE-CAR

## UNCLASSIFIED

- AD-A162 393 \* \* \*  
M-Estimation for Discrete Data.  
Asymptotic Distribution Theory and  
Implications.  
AD-A162 779
- \*CASASANT, DAVID \* \* \*  
Computer Generated Holograms in  
Pattern Recognition: A Review.  
AD-A162 989
- \*CASASSA, M. P. \* \* \*  
Vibrational Deactivation of Surface  
OH Chemisorbed on SiO sub 2:  
Solvent Effects.  
AD-A162 803
- Vibrational Energy Relaxation of  
Adsorbates on Surfaces.  
AD-A162 804
- Time Resolved Measurements of  
Vibrational Relaxation of Molecules  
on Surfaces: Hydroxyl Groups on  
Silica.  
AD-A162 899
- \*CASSENTI, B. N. \* \* \*  
Study of Characteristics of Dry  
Friction Damping.  
AD-A162 770
- \*CAVANAGH, R. R. \* \* \*  
Vibrational Deactivation of Surface  
OH Chemisorbed on SiO sub 2:  
Solvent Effects.  
AD-A162 803
- Vibrational Energy Relaxation of  
Adsorbates on Surfaces.  
AD-A162 804
- Time Resolved Measurements of  
Vibrational Relaxation of Molecules  
on Surfaces: Hydroxyl Groups on  
Silica.
- AD-A162 899
- \*CAVANAGH, STEPHENSON \* \* \*  
Temperature Dependence of the  
Vibrational Population Lifetime of  
OH(v=1) in Fused Silica.  
AD-A162 700
- Picosecond Vibrational Energy  
Relaxation of Surface Hydroxyl  
Groups on Colloidal Silica.  
AD-A162 797
- \*CHA, YUAN \* \* \*  
Carbene and Silicon Routes Toward a  
Simple Nitride Ylide.  
Spectroscopic, Kinetic, and  
Chemical Characterization.  
AD-A162 928
- \*CHAN, WAI \* \* \*  
Peakedness of Weighted Averages of  
Jointly Distributed Random  
Variables.  
AD-A162 876
- \*CHANG, CHE-CHEN \* \* \*  
Velocity Dependence of Azimuthal  
Anisotropies in Ion Scattering from  
Rhodium (111).  
AD-A162 872
- \*CHATURVEDI, S. K. \* \* \*  
Internal Damping of Short-Fiber  
Reinforced Polymer Matrix  
Composites.  
AD-A162 311
- \*CHEN, DANIEL Y. \* \* \*  
Study of Transport Properties and  
Structure of Extended-Chain  
Polymers.  
AD-A162 765
- \*CHEN, SAN-MEI
- Convenient Syntheses of  
Dodecamethylcyclohexasilane und  
Decamethylcyclopentasilane.  
AD-A163 123
- \*CHEUNG, W. -Y. \* \* \*  
State-Resolved Photofragmentation  
of OCS Monomers and Clusters.  
AD-A162 971
- \*CHILDS, DARA W. \* \* \*  
Rotordynamic Forces Developed by  
Labyrinth Seals.  
AD-A162 180
- \*CHIN, BRYAN A. \* \* \*  
Ordered Carbon - Metal Alloys for  
Extraterrestrial Power Systems.  
AD-A162 287
- \*CHOYKE, W. J. \* \* \*  
Plasma Deposition of Silicon  
Carbide Thin Films.  
AD-A161 275
- \*CINLAR, ERHAN \* \* \*  
Markov Processes Applied to  
Control, Replacement, and Signal  
Analysis.  
AD-A162 431
- \*CLINE, JOHN F. \* \* \*  
Electron Nuclear Double Resonance  
Spectra of Cis-Rich and Trans-Rich  
Polyacetylenes between 1.9 and 4.2  
K.  
AD-A162 818
- (13)C and (1)H Hyperfine Tensors  
for Polyacetylene Analyzed in Terms  
of Pi (-o) Electron Coulombic  
Interactions.  
AD-A162 895

PERSONAL AUTHOR INDEX-4  
UNCLASSIFIED EVK551

CAS-CLI



UNCLASSIFIED

\*COGGIOLA, MICHAEL J. \* \* \*  
Production and Properties of  
Metastable Autodetaching Negative  
Ions.  
AD-A181 258

\*CRUICKSHANK, ALEXANDER M. \* \* \*  
Role of Interfaces in Deformation  
and Strengthening.  
AD-A182 289

\*CRUSE, T. A. \* \* \*  
Nonlinear Fracture Mechanics  
Analysis with the Boundary Integral  
Method.  
AD-A182 027

\*CUNNINGHAM, JOSEPH \* \* \*  
Re-Evaluation of Surface Properties  
of Oxide-Cathode Materials.  
AD-A181 131

\*CUTTS, D. G. \* \* \*  
Study of Characteristics of Dry  
Friction Damping.  
AD-A182 770

\*CYLMER, BRADLEY \* \* \*  
Optical Computing Research.  
AD-A182 272

\*DAI, H. L. \* \* \*  
Rotation-Induced Vibrational Mixing  
in X' 1A1 Formaldehyde: Non-  
Negligible Dynamical Consequences  
of Rotation.  
AD-A181 284

\*DAI, HAI-LUNG \* \* \*  
State-Specific Rates of H2CO(So)  
Yields H2 + at Energies Near the  
Top of Barrier: A Violation of RRKM  
Theory.

AD-A161 229 \* \* \*  
Intramolecular Vibrational Dynamics  
Including Rotational Degrees of  
Freedom. Chaos and Quantum Spectra.  
AD-A161 313

\*DALTON, LARRY R. \* \* \*  
Electron Nuclear Double Resonance  
Spectra of Cis-Rich and Trans-Rich  
Polyacetylenes between 1.9 and 4.2  
K.  
AD-A162 818

Electrical and Optical Studies of  
Chemically Synthesized Polypyrrole.  
AD-A182 894

\*DELOUISE, L. A. \* \* \*  
Reduction of Nitric Oxide on the  
Carbon Pretreated Rh(331) Single  
Crystal Surface. Evidence for  
Molecular Cn - Formation.  
AD-A182 950

\*DELOUISE, LISA A. \* \* \*  
Adsorption and Desorption of NO  
from Rh(111) and Rh(331) Surfaces.  
AD-A182 831

Velocity Dependence of Azimuthal  
Anisotropies in Ion Scattering from  
Rhodium (111).  
AD-A182 872

\*DERISO, R. B. \* \* \*  
A Stochastic Population Model for  
Managing the Atlantic Menhaden  
(Brevoortia tyrannus) Fishery and  
Assessing Managerial Risks.  
AD-A182 112

\*DEVATY, R. P. \* \* \*  
Possibility of Observing Quantum  
Size Effects in the Electromagnetic  
Absorption Spectrum of Small Metal

Particles.  
AD-A161 182

\*DEWAR, MICHAEL J. S. \* \* \*  
Development of Practical MO  
techniques for the Prediction of  
the Properties and Behavior of  
Materials.  
AD-A181 992

Thermolysis of Molecules Containing  
NO2 Groups.  
AD-A182 091

MNDO Study of Ring Opening in the  
Succinimidy Radical.  
AD-A182 150

Alternative View of Enzyme  
Reactions.  
AD-A182 198

Can Desolvation of an Ion Be the  
Rate-Determining Step in a  
Reaction?  
AD-A182 297

Does Chair Cyclo-octatetraene  
Exist?  
AD-A182 874

\*DOERSCHUK, PETER C. \* \* \*  
Modeling Electrocardiograms Using  
Interacting Markov Chains.  
AD-A182 758

A Markov Chain Approach to  
Electrocardiogram Modeling and  
Analysis.  
AD-A182 778

\*DOLE, S. L. \* \* \*  
Development of Spacecraft Materials  
and Structures Fundamentals.  
AD-A181 338

\*DOUBLEDAY, CHARLES, JR \* \* \*

PERSONAL AUTHOR INDEX-5  
UNCLASSIFIED EVK551

COG-DOU

# UNCLASSIFIED

Magnetic Field Effect on the  
Intersystem Crossing Rate Constants  
of Biradicals Measured by  
Nanosecond Transient UV Absorption,  
AD-A162 984

\*DOUBLEDAY, CHARLES E., JR

\* \* \*

Nanosecond Flash Photolysis Studies  
of Intersystem Crossing Rate  
Constants in Biradicals: Structural  
Effects Brought about by Spin Orbit  
Coupling,  
AD-A162 948

\*DOUKAS, APOSTOLOS G.

\* \* \*

Semiconductors Investigated by  
Picosecond Absorption, Fluorescence  
and Raman Time-Resolved  
Spectroscopy,  
AD-A162 303

\*DRESSELHAUS, GENE

\* \* \*

Structure-Property Relationships in  
Intercalated Graphite,  
AD-A162 326

\*DRESSELHAUS, MILDRED S.

\* \* \*

Structure-Property Relationships in  
Intercalated Graphite,  
AD-A162 326

\*DREW, D. A.

\* \* \*

Adaptive Finite Element Methods and  
the Numerical Solution of Shear  
Band Problems,  
AD-A162 208

\*DUNKERTON, TIMOTHY J.

\* \* \*

Fluxes of Heat and Constituents Due  
to Convectively Unstable Gravity  
Waves,  
AD-A162 830

\*DUPUIS, MICHEL

\* \* \*

The Intrinsic Reaction Coordinate  
and the Rotational Barrier in  
Silaethylene,  
AD-A162 922

\*DUPUIS, PAUL

\* \* \*

Asymptotic Behavior of Constrained  
Stochastic Approximations via the  
Theory of Large Deviations,  
AD-A162 156

\*DUVAL, L. D.

\* \* \*

Finding Test-and-Treatment  
Procedures Using Parallel  
Computation,  
AD-A162 141

\*DVORAK, GEORGE J.

\* \* \*

Analysis of Progressive Matrix  
Cracking in Composite Laminates,  
AD-A162 220

\*EASTMAN, L. F.

\* \* \*

Microwave Semiconductor Research  
Materials, Devices and Circuits,  
AD-A162 021

\*ECER, AKIN

\* \* \*

A Zonal Approach to the Design of  
Finite Element Grids for 3-D  
transonic Flows with Complex  
Geometries,  
AD-A162 168

\*ECKLUND, W. L.

\* \* \*

Direct Measurement of Large-Scale  
Vertical Velocities Using Clear-Air  
Doppler Radars,  
AD-A162 973

\*ECKLUND, W. L.

\* \* \*

Doppler Radar Measurements of  
Turbulence in the Clear Air,  
AD-A162 991

\*EHLERS, F. E.

\* \* \*  
Coupling Linearized Far-Field  
Boundary Conditions with Nonlinear  
Near-Field Solutions in Transonic  
Flow,  
AD-A162 334

\*EICHMANN, GEORGE

\* \* \*

Optical Acquisition, Image and Data  
Compression,  
AD-A161 650

\*EISENTHAL, K. B.

\* \* \*

Singlet-Triplet Interconversion of  
Diphenylmethylen Energetics,  
Dynamics and Reactivities of  
Different Spin States,  
AD-A162 682

\*EISENTHAL, KENNETH B.

\* \* \*

The Dynamics of Barrier Crossings  
in Solution: The Effect of a  
Solvent Polarity-Dependent Barrier,  
AD-A162 892

\*ELSNER, NORBERT B

\* \* \*

Variable Band Gap Materials for  
Thermophotovoltaic Generators,  
AD-A161 987

\*EMRE, EROL

\* \* \*

On a Theory of Control for Linear  
Systems Over Rings and  
Nonlinear/Time-Varying Systems,  
AD-A162 680

\*ENGBLOM, JOHN J.

\* \* \*

Nonlinear Dynamic Response of  
Composite Rotor Blades,  
AD-A162 158

\*ENGELHARDT, MAX

\* \* \*

Goodness-of-Fit Tests for the  
Weibull Distribution with Unknown

PERSONAL AUTHOR INDEX-6  
UNCLASSIFIED EVK551

DOU-ENG

UNCLASSIFIED

Parameters and Heavy Censoring, AD-A161 406	Terminal Distributions of Rotational Energy in Free Jets of CO and CO <sub>2</sub> , AD-A161 315	Band Problems, AD-A162 206
*EWIG, CARL S. * * *	*FENN, JOHN B. * * *	* * *
Ab Initio Structures of Phosphorus Acids and Esters. 1. Phosphinic, Phosphonic and Phosphoric Acids, AD-A161 216	On the Time Required to Reach Fully Developed Flow in Pulsed Supersonic Free Jets, AD-A161 283	Numerical Study of Quenching of Inward Propagating Spherical Flames, AD-A162 501
* * *	*FIELD, R. W. * * *	*FLEETER, SANFORD * * *
Quantum Theoretical Determination of the Molecular Structure of some Anticholinesterase Agents, AD-A162 074	Rotation-Induced Vibrational Mixing in X' 1A1 Formaldehyde: Non- Negligible Dynamical Consequences of Rotation, AD-A161 284	Research on Aero-Thermodynamic Distortion Induced Structural Dynamic Response of Multi-Stage Compressor Blading, AD-A162 432
The Ab Initio Structure of O-Methyl Methylphosphonofluoridate, AD-A162 817	*FIELD, ROBERT W. * * *	*FLORY, P. J. * * *
*EZEKIEL, S. * * *	State-Specific Rates of H <sub>2</sub> CO(S <sub>0</sub> ) Yields H <sub>2</sub> + at Energies Near the Top of Barrier: A Violation of RRKM Theory, AD-A161 229	Statistical Thermodynamics of Semirigid Macromolecules: Chains with Interconvertible Rodlike and Random-Coil Sequences in Equilibrium, AD-A163 125
Passive Fiber-Optic Ring Resonator for Rotation Sensing, AD-A162 943	Intramolecular Vibrational Dynamics Including Rotational Degrees of Freedom. Chaos and Quantum Spectra, AD-A161 313	Network Topology and the Theory of Rubber Elasticity, AD-A162 829
*FAIRBANK, WILLIAM M. * * *	*FINK, JAMES P. * * *	Molecular Theory of Rubber Elasticity, AD-A162 952
Fundamental Experiments at Liquid Helium Temperatures (Low Temperature Studies of Anomalous Surface Shielding and Related Phenomena). AD-A162 392	Local Error Estimated for Parametrized Nonlinear Equations, AD-A161 077	*FONG, H. H. * * *
*FELDMAN, ALBERT * * *	*FINK, PAMELA K. * * *	Computer-Aided Engineering, AD-A162 811
OM85. Basic Properties of Optical Materials Summaries of Papers. AD-A161 247	The Correction of Ill-Formed Input Using History-Based Expectation with Applications to Speech Understanding, AD-A162 222	*FONTELOT, ROBERT A. * * *
*FENN, J. B. * * *	*FLAHERTY, J. E. * * *	Transformations which Preserve Convexity, AD-A162 681
Distribution of Internal Energy in CO and CO <sub>2</sub> Vibrationally Excited by a Hot Platinum Surface, AD-A161 224	Adaptive Finite Element Methods and the Numerical Solution of Shear	*FRANKEL, M. L. * * *
* * *		Numerical Study of Quenching of Inward Propagating Spherical Flames.
Clustering in Free Jets - Aggregation by Dispersion, AD-A161 314		

PERSONAL AUTHOR INDEX-7  
UNCLASSIFIED EVK551

EWI-FRA

# UNCLASSIFIED

AD-A162 501

\*FREEMAN, MARK J. \* \* \*

Cluster Complex Metathesis.  
Synthesis, Structures, and Dynamic  
Behaviour of Bi- and Tri-Metallic  
Hexanuclear Cluster Complexes  
(MM'Ru4(millimicron3-  
H)2(CO)12(PPH3)2) (M = M' = Cu,  
Ag, or Au; M = Cu, M' = Ag or Au;  
M = Ag, M' = Au).

AD-A162 873

\*FRINGS, W. \* \* \*

Rocket-Borne Measurements of  
Atmospheric Infrared Fluxes,  
AD-A162 819

\*FRITTS, DAVID C. \* \* \*

Fluxes of Heat and Constituents Due  
to Convectively Unstable Gravity  
Waves.

AD-A162 830

\*FROSTIG, YEOSHUA \* \* \*

Buckling of Delaminated Shells and  
Multi-Annular Plates.  
AD-A162 371

\*FUJIKOSHI, Y. \* \* \*

Effect of Additional Variables in  
Principal Component Analysis.  
Discriminant Analysis and Canonical  
Correlation Analysis.  
AD-A162 069

On Tests for Selection of Variables  
and Independence under Multivariate  
Regression Model.  
AD-A162 382

\*GAGE, K. S. \* \* \*

Evidence for Coexisting Spectra of  
Stratified Turbulence and Internal  
Waves in Mesoscale Atmospheric

Velocity Fields,  
AD-A162 840

\* \* \*

Relationship of Precipitation to  
Vertical Motion Observed Directly  
by a VHF Wind Profiler during a  
Spring Upslope Storm Near Denver,  
Colorado.  
AD-A162 970

\* \* \*

Direct Measurement of Large-Scale  
Vertical Velocities Using Clear-Air  
Doppler Radars.  
AD-A162 973

\* \* \*

Doppler Radar Measurements of  
Turbulence in the Clear Air,  
AD-A162 991

\*GARRISON, BARBARA J. \* \* \*

Velocity Dependence of Azimuthal  
Anisotropies in Ion Scattering from  
Rhodium (111).  
AD-A162 872

\*GASDASKA, JOHN R. \* \* \*

Carbene and Silicon Routes Toward a  
Simple Nitride Ylide.  
Spectroscopic, Kinetic, and  
Chemical Characterization.  
AD-A162 928

\*GEORGE, THOMAS F. \* \* \*

Spontaneous Emission by Two Atoms  
With Different Resonance  
Frequencies near Metal Surface,  
AD-A161 123

\* \* \*

Theoretical Studies of Laser-  
Induced Molecular Rate Processes:  
Topics in Line Broadening and  
Spectroscopy.  
AD-A161 132

\* \* \*

Multiple Resonances in Non-Franck-  
Condon Transitions due to Nonlocal  
Effects in Laser-Induced  
Associative Ionization.

PERSONAL AUTHOR INDEX-8  
UNCLASSIFIED EVK551

AD-A161 316

\* \* \*

Theory of Excitation Transfer  
between Rydberg Atoms.  
AD-A162 986

\* \* \*

Theory of Laser-Stimulated Surface  
Processes. II. A Generalized Master-  
Equation Approach to Energy  
Transfer between an IR Laser, an  
Adspecies, and Phonons.  
AD-A163 010

\* \* \*

Neutralization and Excitation in  
Low-Energy Ion-Surface Collisions,  
AD-A163 011

\* \* \*

Quantum Statistical Theory of  
Vibrational Dynamics in a Laser-  
Driven Admolecule-Surface System.  
AD-A163 058

\* \* \*

Recent Advances in the Theory of  
Chem-Ionization,  
AD-A163 128

\*GHONEM, HAMOUDA \* \* \*

Study of Crack Front Distribution  
During Crack Propagation Stage in  
High Performance Alloys.  
AD-A162 742

\*GIBSON, R. F. \* \* \*

Internal Damping of Short-Fiber  
Reinforced Polymer Matrix  
Composites,  
AD-A162 311

\*GILLS, P. F. \* \* \*

Ordered Carbon - Metal Alloys for  
Extraterrestrial Power Systems.  
AD-A162 287

\*GIMPLE, M. \* \* \*

Electromagnetic Sensor Arrays for  
Nondestructive Evaluation and Robot  
Control.

FRE-GIM

## UNCLASSIFIED

AD-A161 292

\*GOLDBERG, MOSHE

Stability Analysis of Finite Difference Schemes for Hyperbolic Systems, and Problems in Applied and Computational Linear Algebra.  
AD-A161 092

Some Inequalities for  $l_p$  Norms of Matrices.  
AD-A162 236

Convenient Stability Criteria for Difference Approximations of Hyperbolic Initial-Boundary Value Problems.  
AD-A162 264

\*GOLDEN, D. M.

Laser-Induced Kinetics: An Experimental and Theoretical Program.  
AD-A161 994

\*GOODMAN, JOSEPH W.

Optical Computing Research.  
AD-A162 272

\*GOODMAN, LIONEL

Multiphoton Ionization Photoelectron Spectroscopy of Phenol: Vibrational Frequencies and Harmonic Force Field for the 2B sub 1 Cation.  
AD-A162 972

\*GORDON, MARK S.

Electronic Structure of the Phosphoryl and Thiophosphoryl Bonds.  
AD-A162 809

\*GORDON, MARK S.

The Intrinsic Reaction Coordinate

and the Rotational Barrier in Silaethylene.  
AD-A162 922

\*GOULD, I. R.

Singlet-Triplet Interconversion of Diphenylmethylene Energetics, Dynamics and Reactivities of Different Spin States.  
AD-A162 682

\*GOULD, IAN R.

Carbene and Silicon Routes Toward a Simple Nitrile Ylide. Spectroscopic, Kinetic, and Chemical Characterization.  
AD-A162 928

\*GOULD, IAN R.

Picosecond Flash Photolysis Studies of Intersystem Crossing Rate Constants in Biradicals: Structural Effects Brought about by Spin Orbit Coupling.  
AD-A162 948

\*GRANDT, ALTEN F., JR

Initiation, Growth, and Coalescence of Small Fatigue Cracks.  
AD-A161 305

\*GRANT, JOHN R.

The Turbulent Gravity Wave-Critical Level Encounter in the Evolution of Atmospheric Flow.  
AD-A162 335

\*GREEN, MICHAEL

Cluster Complex Metathesis. Synthesis, Structures, and Dynamic Behaviour of Bi- and Tri-Metallic Hexanuclear Cluster Complexes (MM'Ru4(millimicron3-H)2(CO)12(PPH3)2) (M = M' = Cu, Ag, or Au; M = Cu, M' = Ag or Au; M = Ag, M' = Au).  
AD-A162 873

\*GREENWALD, RAYMOND A.

High Frequency Radar Studies of the Very High Latitude Ionosphere.  
AD-A162 754

\*HAISLER, W. E.

A Model for Predicting Thermomechanical Response of Large Space Structures.  
AD-A162 139

\*HAISLER, W. E.

A Model for Predicting Thermomechanical Response of Large Space Structures.  
AD-A162 140

\*HALE, JACK K.

Heteroclinic Orbits for Retarded Functional Differential Equations.  
AD-A162 374

\*HALLER, G. L.

Distribution of Internal Energy in CO and CO2 Vibrationally Excited by a Hot Platinum Surface.  
AD-A161 224

\*HALLER, GARY L.

Time-Resolved Infrared Emission Studies of CO(2) Formed by CO oxidation on Pt and Pd.  
AD-A161 166

\*HALPERN, B. L.

Vibrationally Excited CO2 from the Reaction of O Atoms and Adsorbed CO on Platinum.  
AD-A161 219

\*HAMILTON, CHARLES E.

Nascent Product-Vibrational State Distributions of Thermal Ion-Molecule Reactions Determined by Infrared Chemiluminescence.

PERSONAL AUTHOR INDEX-9  
UNCLASSIFIED EVK551

GOL-HAM

UNCLASSIFIED

AD-A162 693

\* \* \*

Product Vibrational State  
Distributions of Thermal Energy  
Charge Transfer Reactions  
Determined by Laser-Induced  
Fluorescence in a Flowing  
Afterglow: Ar(+) + CO Yields  
CO(+)(V=0-8) + Ar.  
AD-A162 985

\*HAN, Y.

\* \* \*

Finding Test-and-Treatment  
Procedures Using Parallel  
Computation.  
AD-A162 141

\*HARDIN, BOBBY O.

\* \* \*

Three-Dimensional Elasto-Plastic  
Analysis for Soils.  
AD-A162 063

\*HARDIN, CLYDE D., JR

\* \* \*

Innovations and Mold Decompositions  
of Stable Sequences.  
AD-A161 437

\*HARIRIAN, M.

\* \* \*

Database Design for Structural  
Analysis and Design Optimization.  
AD-A162 355

\*HARRIS, D. H.

\* \* \*

Phospha-S-Triazines. VIII. Chloro-  
Substituted Diphospha-S-Triazines,  
AD-A161 122

\*HEAVEN, MICHAEL C.

\* \* \*

Laser Induced Fluorescence Study of  
the HeBr<sub>2</sub> Van Der Waals Complex,  
AD-A162 981

\* \* \*

The A' 3P1(2 sub u)-X 1 Sigma (+)  
sub g Emission Spectrum of Br<sub>2</sub> in  
an Argon Matrix,

AD-A163 111

\*HEDAYAT, A. S.

\* \* \*

Combining Experiments under Gauss-  
Markov Models,  
AD-A163 095

\*HEFFERON, G.

\* \* \*

Singlet-Triplet Interconversion of  
Diphenylmethene Energetics,  
Dynamics and Reactivities of  
Different Spin States,  
AD-A162 682

\*HEILWEIL, CASASSA

\* \* \*

Temperature Dependence of the  
Vibrational Population Lifetime of  
OH(v=1) in Fused Silica,  
AD-A162 700

\* \* \*

Picosecond Vibrational Energy  
Relaxation of Surface Hydroxyl  
Groups on Colloidal Silica,  
AD-A162 797

\*HEILWEIL, E. J.

\* \* \*

Vibrational Deactivation of Surface  
OH Chemisorbed on SiO sub 2:  
Solvent Effects,  
AD-A162 803

\* \* \*

Vibrational Energy Relaxation of  
Adsorbates on Surfaces,  
AD-A162 804

\* \* \*

Time Resolved Measurements of  
Vibrational Relaxation of Molecules  
on Surfaces: Hydroxyl Groups on  
Silica,  
AD-A162 899

\*HENNIG, R.

\* \* \*

Rocket-Borne Measurements of  
Atmospheric Infrared Fluxes,  
AD-A162 819

\*HEPBURN, J. W.

\* \* \*

State-Resolved Photofragmentation  
of OCS Monomers and Clusters,  
AD-A162 971

\*HICKS, JANICE

\* \* \*

The Dynamics of Barrier Crossings  
in Solution: The Effect of a  
Solvent Polarity-Dependent Barrier,  
AD-A162 892

\*HOFFMAN, BRIAN M.

\* \* \*

(13)C and (1)H Hyperfine Tensors  
for Polyacetylene Analyzed in Terms  
of P1 (-o) Electron Coulombic  
Interactions.  
AD-A162 895

\*HOFFMANN, ROALD

\* \* \*

Thin Film Synthesis of  
Superconducting Chemical Compounds.  
AD-A162 807

\*HOLLANDER, MYLES

\* \* \*

Efficiency Loss with the Kaplan-  
Meier Estimator.  
AD-A161 341

\*HOLMES, P. J.

\* \* \*

Nonlinear Dynamics and Chaotic  
Motions in Feedback Controlled  
Elastic Systems.  
AD-A162 385

\*HOUSTON, P. L.

\* \* \*

Photodissociation Dynamics of  
Nozzle-Cooled ICN,  
AD-A161 659

\* \* \*

State-Resolved Photofragmentation  
of OCS Monomers and Clusters,  
AD-A162 971

\*HSIEH, S. J.

PERSONAL AUTHOR INDEX-10  
UNCLASSIFIED EVK551

HAN-HSI

## UNCLASSIFIED

- \* \* \*  
Clustering and Ordering in III-V alloys.  
AD-A161 099
- \*HSU, K. H.  
Computer-Aided Engineering.  
AD-A162 811
- \*HUANG, W. S.  
Study of Transport Properties and Structure of Extended-Chain Polymers: Diffusion and Solubility of Gases.  
AD-A162 768
- \*HUANG, XI-YI  
Quantum Statistical Theory of Vibrational Dynamics in a Laser-Driven Admolecule-Surface System.  
AD-A163 058
- \*HYLAND, DAVID C.  
Exploration of the Maximum Entropy/Optimal Projection Approach to Control Design Synthesis for Large Space Structures.  
AD-A161 355
- \*IBRAHIM, RAOUF A.  
Stochastic Non-Linear Flutter of Aeroelastic Structures.  
AD-A162 748
- \*ISAACS, E.  
Infrared Nonlinear Processes in Semiconductors.  
AD-A162 096
- \*JACKOWAY, GARY  
Associative Networks on a Massively Parallel Computer.  
AD-A162 234
- \*JACOBSON, DEAN L.  
Investigation of Material Problems for High Temperature, High Power Space Energy-Conversion Systems.  
AD-A162 227
- \*JANG, SUN-KUK  
Optimization of Tip Store Modeling.  
AD-A162 119
- \*JEFFERSON, THOMAS R.  
The Application of Generalized Geometric Programming (Conjugate Duality) to the Analysis and Solution of Convex Programs.  
AD-A162 288
- \*JOAG-DEV, KUMAR  
Measures of Dependence.  
AD-A162 298
- \*JOHNSON, L. R.  
Regional Studies with Broadband Data.  
AD-A161 497
- \*JOHNSON, SYLVIA M.  
Silicon Nitride Joining.  
AD-A162 337
- \*JUUREK, ZBIGNIEW J.  
Random Integral Representations for Classes of Limit Distributions Similar to Levy Class L(0).  
AD-A161 413
- \*KALLIANPUR, GOPINATH  
Research in Stochastic Processes.  
AD-A162 393
- \*KARIYA, T.  
On Tests for Selection of Variables
- and Independence under Multivariate Regression Model.  
AD-A162 382
- \*KARIYA, TAKEAKI  
Optimality Robustness of Tests in Two Population Problems.  
AD-A162 285
- \*KARPINSKI, ZENON J.  
Electrochemical Studies of Iodine in an Aluminum Chloride-Butylpyridinium Chloride Ionic Liquid. Part 2. Neutral and Basic Solvent Composition.  
AD-A162 075
- \*KARR, ALAN F.  
Electrochemical Studies of Ferrocene and Ferrocenium Ion in Aluminum Chloride-N-1-Butylpyridinium Chloride Ionic Liquid.  
AD-A162 076
- \*KARR, ALAN F.  
Inference for Thinned Point Processes, with Application to Cox Processes.  
AD-A161 328
- \*KATTI, ANITA  
Convenient Syntheses of Dodecamethylcyclohexasilane und Decamethylcyclopentasilane.  
AD-A163 123
- \*KAYE, JACK A.  
Quantum Mechanical Partitioning of Kinetic Energy in Collision-Induced Dissociation.  
AD-A161 167
- \*KAYSER, H.  
Spread Spectrum Acquisition and Tracking.

PERSONAL AUTHOR INDEX-11  
UNCLASSIFIED EVK551

HSU-KAY

# UNCLASSIFIED

AD-A162 442

\*KAZOURA, SAMIH A. \* \* \*

Unsaturated Reactive Intermediates  
in Organosilicon Chemistry - Recent  
Results.  
AD-A162 917

\*KELMA, VIRGINIA \* \* \*

Numerical Algorithms & Parallel  
Tasking.  
AD-A162 221

\*KENNEY, J. \* \* \*

Electromagnetic Sensor Arrays for  
Nondestructive Evaluation and Robot  
Control.  
AD-A161 292

\*KEYSER, DANIEL \* \* \*

A Two-Dimensional Primitive  
Equation Model of Frontogenesis  
Forced by Confluence and Horizontal  
Shear.  
AD-A162 814

\* \* \*

Diagnosis of Ageostrophic  
Circulations in a Two-Dimensional  
Primitive Equation Model of  
Frontogenesis.  
AD-A162 815

\* \* \*

Transverse Ageostrophic  
Circulations Associated with  
Elevated Mixed Layers.  
AD-A163 063

\*KHATRI, C. G. \* \* \*

Effects of Estimated Noise  
Covariance Matrix in Optimal Signal  
Detection.  
AD-A162 798

\*KIM, H. \* \* \*

Electron Nuclear Double Resonance

Spectra of Cis-Rich and Trans-Rich  
Polyacetylenes between 1.9 and 4.2  
K.  
AD-A162 816

\* \* \*

(13)C and (1)H Hyperfine Tensors  
for Polyacetylene Analyzed in Terms  
of Pi (-o) Electron Coulombic  
Interactions.  
AD-A162 895

\*KINSEY, J. L. \* \* \*

Rotation-Induced Vibrational Mixing  
in X' 1A1 Formaldehyde: Non-  
Negligible Dynamical Consequences  
of Rotation.  
AD-A161 284

\*KINSEY, JAMES L. \* \* \*

State-Specific Rates of H2CO(So)  
Yields H2 + at Energies Near the  
Top of Barrier: A Violation of RRKM  
Theory.  
AD-A161 229

\* \* \*

Intramolecular Vibrational Dynamics  
Including Rotational Degrees of  
Freedom. Chaos and Quantum Spectra.  
AD-A161 313

\*KIRSTE, B. \* \* \*

Natural Abundance (13)C and (29)S1  
ENDOR Studies of Cyclopolyisilane  
Radical Anions.  
AD-A162 246

\*KLAUBER, C. \* \* \*

Surface Bonding of the NH3 and NH2  
Species to Ni(110).  
AD-A162 270

\*KLINE, L. E. \* \* \*

Plasma Deposition of Silicon  
Carbide Thin Films.  
AD-A161 275

\*KLITCH, MARJORIE A. \* \* \*

Effects of Mountain Ranges on  
Mesoscale Systems Development.  
AD-A161 136

\*KNYSTAUTAS, R. \* \* \*

Requirements for Initiation and  
Sustained Propagation of Fuel-Air  
Explosives.  
AD-A162 301

\*KORI, M. \* \* \*

Vibrationally Excited CO2 from the  
Reaction of O Atoms and Adsorbed CO  
on Platinum.  
AD-A161 219

\*KORPA, C. L. \* \* \*

Rotation-Induced Vibrational Mixing  
in X' 1A1 Formaldehyde: Non-  
Negligible Dynamical Consequences  
of Rotation.  
AD-A161 284

\*KOSTUK, RAYMOND \* \* \*

Optical Computing Research.  
AD-A162 272

\*KOSUT, ROBERT L. \* \* \*

Robust Adaptive Control.  
AD-A161 349

\*KOTELENEZ, PETER \* \* \*

Fluctuations Near Homogeneous  
States of Chemical Reactions with  
Diffusion.  
AD-A162 875

\*KRATZER, R. H. \* \* \*

Phospha-S-Triazines. VIII. Chloro-  
Substituted Diphospha-S-Triazines.  
AD-A161 122

PERSONAL AUTHOR INDEX-12  
UNCLASSIFIED EVK551

KAZ-KRA



UNCLASSIFIED

- \*KRIER, HERMAN \* \* \*  
Prediction of Detonation Transition  
in Porous Explosives from Rapid  
Compression Loadings.  
AD-A182 787
- \*KRISHNAIAH, P. R. \* \* \*  
Inference for Thinned Point  
Processes, with Application to Cox  
Processes,  
AD-A181 328
- \*On Detection of Number of Signals  
in Presence of Colored Noise Using  
Information Theoretic Criteria.  
AD-A181 847
- \*Effect of Additional Variables in  
Principal Component Analysis,  
Discriminant Analysis and Canonical  
Correlation Analysis.  
AD-A182 089
- \*On Tests for Selection of Variables  
and Independence under Multivariate  
Regression Model.  
AD-A182 382
- \*KROGH-JESPERSEN, KARSTEN \* \* \*  
Multiphoton Ionization  
Photoelectron Spectroscopy of  
Phenol: Vibrational Frequencies and  
Harmonic Force Field for the 2B sub  
1 Cation,  
AD-A182 972
- \*KRUSE, PAUL W. \* \* \*  
Nonlinear Optical Phenomena in  
Solids.  
AD-A182 394
- \*KRYDER, MARK H. \* \* \*  
A Program of Research on  
Microfabrication Techniques for  
VLSI Magnetic Devices.  
AD-A181 271
- \*KUPPERMANN, ARON \* \* \*  
Quantum Mechanical Partitioning of  
Kinetic Energy in Collision-Induced  
Dissociation,  
AD-A181 167
- \*KURRECK, H. \* \* \*  
Natural Abundance (13)C and (29)Si  
ENDOR Studies of Cyclopentasilane  
Radical Anions,  
AD-A182 248
- \*KUSHNER, H. J. \* \* \*  
Asymptotic Global Behavior for  
Stochastic Approximations and  
Diffusions with Slowly Decreasing  
Noise Effects: Global Minimization  
via Monte Carlo.  
AD-A182 333
- \*KUSHNER, HAROLD J. \* \* \*  
Asymptotic Behavior of Constrained  
Stochastic Approximations via the  
Theory of Large Deviations.  
AD-A182 158
- \*Nearly Optimal State Feedback  
Controls for Stochastic Systems  
with Wideband Noise Disturbances.  
AD-A182 271
- \*KWON, T. M. \* \* \*  
Investigation of Rubidium Hyperfine  
Structure Frequency Stabilization  
Mechanisms.  
AD-A182 388
- \*LAM, KAI S. \* \* \*  
Spontaneous Emission by Two Atoms  
with Different Resonance  
Frequencies near Metal Surface,  
AD-A181 123
- \*LAM, KAI-SHUE \* \* \*  
Neutralization and Excitation in
- Multiple Resonances in Non-Franck-  
Condon Transitions due to Nonlocal  
Effects in Laser-Induced  
Associative Ionization,  
AD-A181 318
- \*Recent Advances in the Theory of  
Chem-Ionization,  
AD-A183 128
- \*LANGE, G. \* \* \*  
Ground-Based Atmospheric Infrared  
and Visible Emission Measurements.  
AD-A182 930
- \*LANGFORD, ANDREW O. \* \* \*  
Flowing Afterglow Infrared  
Chemiluminescence Studies of  
Vibrational Energy Disposal in the  
Ion-Molecule Reactions F- + HBr, DBr  
Yields HF, DF + Br-.  
AD-A182 980
- \*LARSEN, D. M. \* \* \*  
Infrared Nonlinear Processes in  
Semiconductors.  
AD-A182 098
- \*LAWLESS, KENNETH R. \* \* \*  
Study of Transport Properties and  
Structure of Extended-Chain  
Polymers.  
AD-A182 785
- \*LEADBETTER, M. R. \* \* \*  
Research in Stochastic Processes.  
AD-A182 393
- \*LEE, DUCKHWAN \* \* \*  
Scaling of Nonlocal Operators,  
AD-A182 929
- \*LEE, HAI W. \* \* \*

PERSONAL AUTHOR INDEX-13  
UNCLASSIFIED EVK551

KRI-LEE

UNCLASSIFIED

Low-Energy Ion-Surface Collisions,  
AD-A163 011

\*LEE, J. H.

Requirements for Initiation and  
Sustained Propagation of Fuel-Air  
Explosives.  
AD-A162 301

\*LEE, LONG C.

Electron Production, Electron  
Attachment, and Charge  
Recombination Process in High  
Pressure Gas Discharges.  
AD-A162 747

\*LEE, SAMSON S.

Wave Measurements on Truss Model.  
AD-A162 433

\*LEONE, STEPHEN R.

Nascent Product-Vibrational State  
Distributions of Thermal Ion-  
Molecule Reactions Determined by  
Infrared Chemiluminescence,  
AD-A162 693

\* \* \*

Flowing Afterglow Infrared  
Chemiluminescence Studies of  
Vibrational Energy Disposal in the  
Ion-Molecule Reactions F- + HBr, DBr  
Yields HF, DF + Br-,  
AD-A162 980

\* \* \*

Product Vibrational State  
Distributions of Thermal Energy  
Charge Transfer Reactions  
Determined by Laser-Induced  
Fluorescence in a Flowing  
Afterglow: Ar(+) + CO Yields  
CO(+)(V=0-6) + Ar,  
AD-A162 985

\*LEUNG, J. Y.

Computer-Aided Engineering.  
AD-A162 811

\*LEVINE, HOWARD A.

Numerical Solution of III Posed  
Problems in Partial Differential  
Equations.  
AD-A162 378

\*LEVY, BERNARD

A Final Technical Report of  
Research on under Grant AFOSR-82-  
0135.  
AD-A161 334

\*LEVY, BERNARD C.

The Shur Algorithm and Its  
Applications.  
AD-A161 011

\*LEWIS, E. E.

Monte Carlo Reliability Analysis.  
AD-A162 379

\*LIN, CHUN C.

Infrared Emission and Atomic  
Transitions.  
AD-A162 245

\*LIN, KING C.

Collisional Deactivation of  
K(5(2)P(J)) by H(2). Identification  
of the Primary Quenching Channel,  
AD-A162 903

\*LIN, X. B.

Heterocyclic Orbits for Retarded  
Functional Differential Equations,  
AD-A162 374

\*LINTON, PAUL F.

Generalized Phenomenological Cyclic  
Stress-Strain-Strength  
Characterization of Anisotropic  
Granular Media.  
AD-A162 348

\*LIO, Y. L.

Some Convergence Results for Kernel-  
Type Quantile Estimators under  
Censoring.  
AD-A162 837

\*LIPSON, S. G.

Measurement of Atmospheric  
Transmission Over Long Paths in the  
Infrared Spectral Region.  
AD-A161 258

\*LIPSZTAJN, M.

Electrochemical Reduction of N-(1-  
Butyl)pyridinium Cation in 1-Methyl-  
3-Ethylimidazolium Chloride-  
Aluminum Chloride Ambient  
Temperature Ionic Liquids,  
AD-A162 078

\*LIPSZTAJN, MAREK

On Ionic Association in Ambient  
Temperature Chloroaluminate Molten  
Salts. Analysis of Electrochemical  
and Conductance Data,  
AD-A161 189

\* \* \*

Electrochemistry in Neutral Ambient-  
Temperature Ionic Liquids. 1.  
Studies of Iron (III), Neodymium  
(III), and Lithium(I),  
AD-A162 077

\*LITTER, MARTA I.

Polyaromatic Ether-Ketones and  
Polyaromatic Ether-Keton  
Sulfonamides from 4-Phenoxybenzoyl  
Chloride and from 4,4'-  
Dichloroformylidiphenyl Ether,  
AD-A161 265

\*LIU, W. K.

Computer-Aided Engineering.  
AD-A162 811

PERSONAL AUTHOR INDEX-14  
UNCLASSIFIED EVK551

LEE-LIU

## UNCLASSIFIED

- \*LOOKABAUGH, T. \* \* \*  
Electromagnetic Sensor Arrays for  
Nondestructive Evaluation and Robot  
Control.  
AD-A161 292
- \*LOU, XI-CHENG \* \* \*  
An Algebraic Approach to Time Scale  
Analysis and Control.  
AD-A162 806
- \*LOVELAND, D. W. \* \* \*  
Finding Test-and-Treatment  
Procedures Using Parallel  
Computation.  
AD-A162 141
- \*LOVELAND, DONALD W. \* \* \*  
Finding Critical Sets.  
AD-A161 388
- \*LUI, NAN S. \* \* \*  
Numerical Simulation of Unsteady  
Three-Dimensional Turbulent  
Structures in Boundary Layer Flows.  
AD-A162 130
- \*LUO, C. M. \* \* \*  
Mega-Amp Opening Switch with Nested  
Electrodes/Pulsed Generator of Ion  
and Ion Cluster Beams.  
AD-A162 850
- \*MADEY, JOHN M. J. \* \* \*  
Fundamental Experiments at Liquid  
Helium Temperatures (Low  
Temperature Studies of Anomalous  
Surface Shielding and Related  
Phenomena).  
AD-A162 392
- \*MADSEN, N. H. \* \* \*  
Ordered Carbon - Metal Alloys for
- Extraterrestrial Power Systems.  
AD-A162 287
- \*MAJUMDAR, DIBYEN \* \* \*  
Combining Experiments under Gauss-  
Markov Models,  
AD-A163 095
- \*MAMUEL, GEORGES \* \* \*  
Unsaturated Reactive Intermediates  
in Organosilicon Chemistry - Recent  
Results.  
AD-A162 917
- \*MANTELL, D. A. \* \* \*  
Distribution of Internal Energy in  
CO and CO<sub>2</sub> Vibrationally Excited by  
a Hot Platinum Surface.  
AD-A161 224
- \*MANTELL, DAVID A. \* \* \*  
Time-Resolved Infrared Emission  
Studies of CO(2) Formed by CO  
oxidation on Pt and Pd.  
AD-A161 168
- \*MARCUS, MARVIN \* \* \*  
Stability Analysis of Finite  
Difference Schemes for Hyperbolic  
Systems, and Problems in Applied  
and Computational Linear Algebra.  
AD-A161 092
- \*MARIE, RAYMOND \* \* \*  
Transient Solution of Acyclic  
Markov Chains.  
AD-A162 314
- \*MARINELLI, W. J. \* \* \*  
Photodissociation Dynamics of  
Nozzle-Cooled ICN,  
AD-A161 659
- \*MARKIEWICZ, R. S.
- \*MARROQUIN, JOSE L. \* \* \*  
Probabilistic Solution of Inverse  
Problems.  
AD-A161 130
- \*MARSHALL, A. W. \* \* \*  
Inconsistency of the Maximum  
Likelihood Estimator of a  
Distribution Having Increasing  
Failure Rate Average.  
AD-A162 199
- \*MARVEL, CARL S. \* \* \*  
Polyaromatic Ether-Ketones and  
Polyaromatic Ether-Keton  
Sulfonamides from 4-Phenoxybenzoyl  
Chloride and from 4,4'-  
Dichlorodiphenyl Ether.  
AD-A161 265
- \*MATHESON, R. R., JR. \* \* \*  
Statistical Thermodynamics of  
Semirigid Macromolecules: Chains  
with Interconvertible Rodlike and  
Random-Coil Sequences in  
Equilibrium.  
AD-A163 125
- \*MAXWELL, TIMOTHY T. \* \* \*  
The Influence of Fluid Mechanics on  
the Behavior of Gas-Blown Spark Gap  
Switches.  
AD-A161 288
- \*MCANELLY, RAY L. \* \* \*  
Effects of Mountain Ranges on  
Mesoscale Systems Development.  
AD-A161 136
- \*MCCAFFREY, ROBERT R.

PERSONAL AUTHOR INDEX-15  
UNCLASSIFIED EVK551

L00-MCC

## UNCLASSIFIED

- \* \* \*  
 Organic-Thin-Film-Coated Solar Cells: Energy Transfer between Surface Pyrene Molecules and the Silicon Semiconductor Substrate.  
 AD-A161 151
- \*MCCLELLAND, T. \* \* \*  
 Investigation of Rubidium Hyperfine Structure Frequency Stabilization Mechanisms.  
 AD-A162 388
- \*MCDONALD, HENRY \* \* \*  
 Numerical Simulation of Unsteady Three-Dimensional Turbulent Structures in Boundary Layer Flows.  
 AD-A162 130
- \*MCEVILLY, T. V. \* \* \*  
 Regional Studies with Broadband Data.  
 AD-A161 497
- \*MCMILLAN, W. G. \* \* \*  
 Earthquake Light.  
 AD-A161 385
- \*MCVAY, MICHAEL C. \* \* \*  
 Generalized Phenomenological Cyclic Stress-Strain-Strength Characterization of Anisotropic Granular Media.  
 AD-A162 348
- \*MERZ, KENNETH M., JR \* \* \*  
 Does Chair Cyclo-octatetraene Exist?  
 AD-A162 874
- \*MESSIER, RUSSELL \* \* \*  
 Investigations into the Origins of the Physical Structure of Thin Films.
- AD-A162 772
- \*MEYER, R. E. \* \* \*  
 Passive Fiber-Optic Ring Resonator for Rotation Sensing.  
 AD-A162 943
- \*MIAMEE, A. G. \* \* \*  
 On Prediction of Harmonizable Stable Processes.  
 AD-A161 412
- \*MICHALCZYK, MICHAEL J. \* \* \*  
 Kinetics of Thermal Cis-Trans Isomerizations in Disilenes.  
 AD-A162 350
- \*MICHL, JOSEF \* \* \*  
 Kinetics of Thermal Cis-Trans Isomerizations in Disilenes.  
 AD-A162 350
- \*MILLER, BRUCE L. \* \* \*  
 Sequential Decision Models in Reliability.  
 AD-A162 332
- \*MIMMACK, GILLIAN M. \* \* \*  
 Piecewise Geometric Estimation of a Survival Function.  
 AD-A161 322
- \*MITTER, SANJOY K. \* \* \*  
 A Final Technical Report of Research on under Grant AFOSR-82-0135.  
 AD-A161 334
- \*MOLUSIS, J. A. \* \* \*  
 Dual Control and Prevention of the Turn-off Phenomenon in a Class of Mimo Systems.  
 AD-A161 589
- \*MOOKERJEE, P. \* \* \*  
 Dual Control and Prevention of the Turn-off Phenomenon in a Class of Mimo Systems.  
 AD-A161 589
- \*MOON, F. C. \* \* \*  
 Nonlinear Dynamics and Chaotic Motions in Feedback Controlled Elastic Systems.  
 AD-A162 385
- \*MOORE, ROBERT C. \* \* \*  
 Knowledge Representation and Natural-Language Semantics.  
 AD-A162 389
- \*MORRIS, JAMES F. \* \* \*  
 Investigation of Material Problems for High Temperature, High Power Space Energy-Conversion Systems.  
 AD-A162 227
- \*MORROBEL-SOSA, A. \* \* \*  
 Electron Nuclear Double Resonance Spectra of Cis-Rich and Trans-Rich Polyacetylenes between 1.9 and 4.2 K.  
 AD-A162 816
- \*MORSE, A. S. \* \* \*  
 (13)C and (1)H Hyperfine Tensors for Polyacetylene Analyzed in Terms of Pi (-o) Electron Coulombic Interactions.  
 AD-A162 895
- \*MORSE, A. S. \* \* \*  
 New Directions in Parameter Adaptive Control.  
 AD-A161 713
- \*MOLUSIS, J. A. \* \* \*  
 Dual Control and Prevention of the Turn-off Phenomenon in a Class of Mimo Systems.  
 AD-A161 589
- \*MORSE, A. S. \* \* \*  
 A Smooth Algorithm for Adaptive Stabilization of a Discrete Linear System with an Unknown High Frequency Gain.

 PERSONAL AUTHOR INDEX-16  
 UNCLASSIFIED EVK551

MCC-MOR

# UNCLASSIFIED

- AD-A162 247      \* \* \*  
Adaptive Control of Multivariable Systems.  
AD-A162 795
- \* \* \*  
A 4(n+1)-Dimensional Model  
Reference Adaptive Control for the Stabilization of any Strictly Proper Minimum Phase Linear Systems with Relative Degree Not Exceeding n, Two and Dimension Not Exceeding n.  
AD-A162 808
- \* \* \*  
Adaptive Stabilization of Linear Systems with Unknown High-Frequency Gains.  
AD-A162 921
- \*MOSES, HARVEY E.      \* \* \*  
Research on the Inverse Problem of Scattering.  
AD-A161 248
- \*MUDGETT, D. R.      \* \* \*  
A Smooth Algorithm for Adaptive Stabilization of a Discrete Linear System with an Unknown High Frequency Gain.  
AD-A162 247
- \*MUDGETT, DAVID R.      \* \* \*  
Adaptive Stabilization of Linear Systems with Unknown High-Frequency Gains.  
AD-A162 921
- \*MUKHERJEE, S. D.      \* \* \*  
Microwave Semiconductor Research Materials, Devices and Circuits.  
AD-A162 021
- \*MUKHOPADHYAY, S.      \* \* \*  
Specification for MIDAS-GR. Management of Information for Design and Analysis of System.
- Generalized Relational Model.  
AD-A162 086
- \*MULLER, M. W.      \* \* \*  
Clustering and Ordering in III-V alloys.  
AD-A161 099
- \*MURAKA, TSUTOMU      \* \* \*  
ESR (Electron Spin Resonance) Spectra for Anion Radicals of Alkylcyclootetrasilanes and Cyclopentasilanes.  
AD-A162 919
- \*MURTHY, T. S.      \* \* \*  
Database Design Methodology and Database Management System for Computer-Aided Structural Design Optimization.  
AD-A162 101
- \*NAGAI, YOICHIRO      \* \* \*  
ESR (Electron Spin Resonance) Spectra for Anion Radicals of Alkylcyclootetrasilanes and Cyclopentasilanes.  
AD-A162 919
- \*NAKAHARA, J. H.      \* \* \*  
Phospha-S-Triazines. VIII. Chloro-Substituted Diphospha-S-Triazines.  
AD-A161 122
- \*NALWA, HARI S.      \* \* \*  
Electrical and Optical Studies of Chemically Synthesized Polypyrrole.  
AD-A162 894
- \*NANJUNDIAH, CHENNIATIAH      \* \* \*  
Electrochemical Studies of Ferrocene and Ferrocenium Ion in Aluminum Chloride-N-1-Butylpyridinium Chloride Ionic
- Liquid.  
AD-A162 076
- \*NARDI, V.      \* \* \*  
Mega-Amp Opening Switch with Nested Electrodes/Pulsed Generator of Ion and Ion Cluster Beams.  
AD-A162 850
- \*NASTROM, G. D.      \* \* \*  
Evidence for Coexisting Spectra of Stratified Turbulence and Internal Waves in Mesoscale Atmospheric Velocity Fields.  
AD-A162 840
- \* \* \*  
Relationship of Precipitation to Vertical Motion Observed Directly by a VHF Wind Profiler during a Spring Upslope Storm Near Denver, Colorado.  
AD-A162 970
- \* \* \*  
Direct Measurement of Large-Scale Vertical Velocities Using Clear-Air Doppler Radars.  
AD-A162 973
- \* \* \*  
The Interaction and Variation of Waves and Turbulence from MST Radar Data.  
AD-A162 983
- \* \* \*  
Doppler Radar Measurements of Turbulence in the Clear Air.  
AD-A162 991
- \*NICOLAI, JEAN-PHILIPPE      \* \* \*  
Laser Induced Fluorescence Study of the HeBr<sub>2</sub> Van Der Waals Complex.  
AD-A162 981
- \* \* \*  
The A' 3P(2 sub u)-X 1 Sigma (+) sub g Emission Spectrum of Br<sub>2</sub> in an Argon Matrix.  
AD-A163 111
- \*NIX, WILLIAM D.

PERSONAL AUTHOR INDEX-17  
UNCLASSIFIED EVK551

MOS-NIX

# UNCLASSIFIED

\*\*\*  
Role of Interfaces in Deformation  
and Strengthening.  
AD-A162 289

\*NOORBATCHA, I. \*\*\*  
Monte Carlo Random Walk Study of  
Recombination and Desorption of  
Hydrogen on Si(111).  
AD-A162 278

\*OCHOA, ELLEN \*\*\*  
Optical Computing Research.  
AD-A162 272

\*OCHOA, OZDEN O. \*\*\*  
Nonlinear Dynamic Response of  
Composite Rotor Blades.  
AD-A162 158

\*OFFERMANN, D. \*\*\*  
Ground-Based Atmospheric Infrared  
and Visible Emission Measurements.  
AD-A162 930

\*OLIVELLA, SANTIAGO \*\*\*  
MNDO Study of Ring Opening in the  
Succinimidy Radical.  
AD-A162 150

\*OPPENHEIM, U. P. \*\*\*  
Measurement of Atmospheric  
Transmission Over Long Paths in the  
Infrared Spectral Region.  
AD-A161 258

\*ORCUTT, JOHN A. \*\*\*  
Analysis of MSS (Marine Seismic  
System) and OBS (Ocean Bottom  
Seismograph) Data Collected during  
the NGENDEI Seismic Experiment.  
AD-A162 354

\*ORPHEN, A. GUY

\*\*\*  
Cluster Complex Metathesis.  
Synthesis, Structures, and Dynamic  
Behaviour of Bi- and Tri-Metallic  
Hexanuclear Cluster Complexes  
(MM'Ru4(m11)micron3-  
H)2(CO)12(PPh3)2) (M = M' = Cu,  
Ag, or Au; M = Cu, M' = Ag or Au;  
M = Ag, M' = Au).  
AD-A162 873

\*OSTERYOUNG, R. A. \*\*\*  
Electrochemical Reduction of N-(1-  
Butyl)pyridinium Cation in 1-Methyl-  
3-Ethylimidazolium Chloride-  
Aluminum Chloride Ambient  
Temperature Ionic Liquids.  
AD-A162 078

\*OSTERYOUNG, ROBERT A. \*\*\*  
Electrochemical Oxidation of Some  
Metal Carbonyls in Ambient  
Temperature Ionic Liquids.  
AD-A161 168

\*\*\*  
On Ionic Association in Ambient  
Temperature Chloroaluminate Molten  
Salts. Analysis of Electrochemical  
and Conductance Data.  
AD-A161 169

\*\*\*  
Charge Transport in Poly-(Ru(2,2'-  
Bipyridine)2(4-  
Vinylpyridine)2)(3+/2) Films in  
AlCl3/N-(1-Butyl)pyridinium  
Chloride and AlCl3/1-Methyl(3-  
Ethyl)imidazolium Chloride Molten  
Salts.  
AD-A161 228

\*\*\*  
Electrochemical Studies of Iodine  
in an Aluminum Chloride-  
Butylpyridinium Chloride Ionic  
Liquid. Part 2. Neutral and Basic  
Solvent Composition.  
AD-A162 075

\*\*\*  
Electrochemical Studies of  
Ferrocene and Ferrocenium Ion in

PERSONAL AUTHOR INDEX-18  
UNCLASSIFIED EVK551

Aluminum Chloride-N-1-  
Butylpyridinium Chloride Ionic  
Liquid.  
AD-A162 078

\*\*\*  
Electrochemistry in Neutral Ambient-  
Temperature Ionic Liquids. 1.  
Studies of Iron (III), Neodymium  
(III), and Lithium(I).  
AD-A162 077

\*OU, HOWARD L. \*\*\*  
Wave Measurements on Truss Model.  
AD-A162 433

\*OZKABAK, ALI G. \*\*\*  
Multiphoton Ionization  
Photoelectron Spectroscopy of  
Phenol: Vibrational Frequencies and  
Harmonic Force Field for the 2B sub  
1 Cation.  
AD-A162 972

\*PACHALY, BERND \*\*\*  
Synthesis of a 1,3-Dioxo-2,4-  
diborethane: An Oxoborane Precursor.  
AD-A162 497

\*PACIOREI, K. J. L. \*\*\*  
Phospha-S-Triazines. VIII. Chloro-  
Substituted Diphospha-S-Triazines.  
AD-A161 122

\*PACZKOWSKI, M. A. \*\*\*  
The Observation of CIDEP  
(chemically Induced Dynamic  
Electron Polarization) from the  
Photodecomposition of Dibenzyl  
Ketone in Micellar Solution.  
AD-A161 680

\*PADGETT, W. J. \*\*\*  
Some Convergence Results for Kernel-  
Type Quantile Estimators under  
Censoring.

NOO-PAD

UNCLASSIFIED

AD-A162 837	* * *	* * *	AD-A161 908
*PADWA, ALBERT	Carbene and Silicon Routes Toward a Simple Nitrile Ylide.	Clustering and Ordering in III-V alloys.	*PELIGRAD, MAGDA
	Spectroscopic, Kinetic, and Chemical Characterization.		Invariance Principles Under a Two-Part Mixing Assumption.
AD-A162 928			AD-A162 800
*PAENG, J. K.			*PEREZ-ABREU, VICTOR
	Database Design for Structural Analysis and Design Optimization.		* * *
AD-A162 355			Product Stochastic Measures.
*PAI, YI-MING			AD-A162 833
	Adamantylidimethylsilyl Ethers.		*PETERSON, JAMES R.
AD-A162 073			* * *
	Silicon-29 NMR Studies of Polymethylhydrosiloxanes: Spin-Lattice Relaxation Time (T <sub>1</sub> ) Measurements.		Production and Properties of Metastable Autodetaching Negative Ions.
AD-A162 992			AD-A161 256
*PARK, DONG HO			*PFEIFER, DIETMAR
	Peakedness of Weighted Averages of Jointly Distributed Random Variables.		* * *
AD-A162 876			On the Distance between Mixed Poisson and Poisson Distributions.
*PARTER, SEYMOUR V.			AD-A161 337
	On an Estimate for the Three-Grid MGR Multigrid Method.		* * *
AD-A161 096			Some General Probabilistic Estimations for the Rate of Convergence in Operator Semigroup Representations.
	On the Distribution of the Singular Values of Toeplitz Matrices.		AD-A161 359
AD-A161 146			* * *
*PARTLOW, W. D.			On a Joint Strong Approximation Theorem for Record and Inter-Record Times.
	Plasma Deposition of Silicon Carbide Thin Films.		AD-A162 868
AD-A161 275			* * *
			A Martingale Characterization of Mixed Poisson Processes.
*PATTEN, ELIZABETH A.			AD-A162 957
			*PICKUP, PETER G.
			* * *
			Charge Transport in Poly-(Ru(2,2'-Bipyridine) <sub>2</sub> (4-Vinylpyridine) <sub>2</sub> )(3+/2) Films in AlCl <sub>3</sub> /N-(1-Butyl)pyridinium Chloride and AlCl <sub>3</sub> /1-Methyl(3-Ethyl)imidazolium Chloride Molten Salts.
			AD-A161 228

PERSONAL AUTHOR INDEX-19  
UNCLASSIFIED EVK551

PAD-PIC

# UNCLASSIFIED

- \*POLCH, E. Z. \* \* \*  
Nonlinear Fracture Mechanics  
Analysis with the Boundary Integral  
Method.  
AD-A162 027
- \*PONELL, C. \* \* \*  
Mega-Amp Opening Switch with Nested  
Electrodes/Pulsed Generator of Ion  
and Ion Cluster Beams.  
AD-A162 850
- \*PRADHAN, D. K. \* \* \*  
The De Bruijn Multiprocessor  
Network: A Versatile Sorting  
Network.  
AD-A161 509
- \*PRADHAN, DHIRAJ K. \* \* \*  
Dynamically Restructurable Fault-  
Tolerant Processor Network  
Architectures,  
AD-A161 356
- \*PRASAD, PARAS N. \* \* \*  
Molecular Mechanics of Polymeric  
Interactions.  
AD-A161 095
- \* \* \*  
Laser Raman Investigation of Drug-  
Polymer Conjugates: Sulfathiazole-  
Povidone Coprecipitates,  
AD-A161 115
- \* \* \*  
Nonlinear Electroacoustic  
Phenomena: Phonon Echo in d-  
Tartaric Acid and Its Salts,  
AD-A161 140
- \* \* \*  
Organic-Thin-Film-Coated Solar  
Cells: Energy Transfer between  
Surface Pyrene Molecules and the  
Silicon Semiconductor Substrate,  
AD-A161 151
- \* \* \*  
Molecular Mechanics of
- \*PROCHAZKA, S. \* \* \*  
Photopolymerization of 2,5-  
Distyrylpyrazine in Solid state,  
AD-A161 317
- \*PROSCHAN, F. \* \* \*  
Development of Spacecraft Materials  
and Structures Fundamentals.  
AD-A161 338
- \*PROSCHAN, FRANK \* \* \*  
Moment and Geometric Probability  
Inequalities Arising from  
Arrangement Increasing Functions.  
AD-A161 273
- \* \* \*  
Piecewise Geometric Estimation of a  
Survival Function.  
AD-A161 322
- \* \* \*  
Efficiency Loss with the Kaplan-  
Meier Estimator.  
AD-A161 341
- \* \* \*  
Transformations which Preserve  
Convexity,  
AD-A162 681
- \* \* \*  
Fault Diversity in Software  
Reliability.  
AD-A162 757
- \* \* \*  
Peakedness of Weighted Averages of  
Jointly Distributed Random  
Variables.  
AD-A162 876
- \*RABE, JOHANN G. \* \* \*  
Electrical and Optical Studies of  
Chemically Synthesized Polypyrrole.  
AD-A162 894
- \*RABITZ, HERSHEL \* \* \*  
Dynamics and Kinetics on Surfaces  
Exhibiting Defects,  
AD-A162 908
- \* \* \*  
Scaling of Nonlocal Operators,  
AD-A162 929
- \*RAFF, L. M. \* \* \*  
Monte Carlo Transition-State Study  
of Angular Momentum Effects on the  
Unimolecular Dissociation of CH(4)  
on the Duchovic-Hase-Schlegel ab  
initio Surface,  
AD-A162 218
- \*RAFF, LIONEL M. \* \* \*  
Monte Carlo Random Walk Study of  
Recombination and Desorption of  
Hydrogen on Si(111),  
AD-A162 278
- \* \* \*  
Theoretical Investigations of the  
CVD (Chemical Vapor Deposition) of  
Silicon from Silane.  
AD-A162 548
- \* \* \*  
Semiclassical Wave Packet Studies  
of Elastic and Inelastic Atom-  
Surface Scattering from a 3D Model  
Surface,  
AD-A162 692
- \*RAJAN, S. D. \* \* \*  
Database Management in Design  
Optimization.  
AD-A162 212
- \*RAMAKRISHNAN, I. V. \* \* \*  
Updating Properties of Directed  
Acyclic Graphs on a Parallel Random  
Access Machine.  
AD-A162 954
- \*RAMALINGAM, MYSORE \* \* \*

PERSONAL AUTHOR INDEX-20  
UNCLASSIFIED EVK551

POL-RAM



UNCLASSIFIED

Investigation of Material Problems for High Temperature, High Power Space Energy-Conversion Systems. AD-A162 227	AD-A162 689	AD-A162 153
*RAMASWAMY, S. * * *	*REIBMAN, ANDREW * * *	*RITCHIE, JAMES P. * * *
Existence of Random Variables with Values in the Dual of a Nuclear Space. AD-A161 343	Transient Solution of Acyclic Markov Chains. AD-A162 314	Thermolysis of Molecules Containing NO <sub>2</sub> Groups. AD-A162 091
*RAND, R. H. * * *	*REISH, R. L. * * *	*ROBLIN, P. * * *
Nonlinear Dynamics and Chaotic Motions in Feedback Controlled Elastic Systems. AD-A162 385	A Stochastic Population Model for Managing the Atlantic Menhaden (Brevoortia tyrannus) Fishery and Assessing Managerial Risks. AD-A162 112	Clustering and Ordering in III-V alloys. AD-A161 099
*RAD, C. R. * * *	*REITER, ELMAR R. * * *	*ROHLICEK, JAN R. * * *
Effects of Estimated Noise Covariance Matrix in Optimal Signal Detection. AD-A162 796	Effects of Mountain Ranges on Mesoscale Systems Development. AD-A161 136	The Reduction of Perturbed Markov Generators: An Algorithm Exposing the Role of Transient States. AD-A162 773
*REDDY, AMBUR D. * * *	Vertical Interpolation of Meteorological Variables in Low- Resolution Numerical Models. AD-A162 818	*ROSENKRANTZ, W. * * *
Analysis and Experiments on Interlaminar Fracture Toughness in Resin Matrix Composites. AD-A162 689	*RHEINBOLDT, WERNER C. * * *	A Birth and Death Process Approximation for the Slotted ALOHA Algorithm. AD-A162 153
*REDDY, C. P. D. * * *	Local Error Estimated for Parametrized Nonlinear Equations. AD-A161 077	*ROSINSKI, JAN * * *
Database Management in Design Optimization. AD-A162 212	*RHODE, DAVID L. * * *	On Stochastic Integration by Series of Wiener Integrals. AD-A161 514
*REEVE, JOHN N. * * *	Rotodynamic Forces Developed by Labyrinth Seals. AD-A162 160	*ROSS, JOHN * * *
Development and Use of Anucleated Bacterial Cells to Assay the in vivo Activity of Pollutants. AD-A162 727	*RICE, JACQUELINE B. * * *	Theory and Experiments on Chemical Instabilities. AD-A162 430
*REHFELD, LAWRENCE W. * * *	Development and Use of Anucleated Bacterial Cells to Assay the in vivo Activity of Pollutants. AD-A162 727	*ROSSI, M. J. * * *
Analysis and Experiments on Interlaminar Fracture Toughness in Resin Matrix Composites.	*RISING, W. * * *	Laser-Induced Kinetics: An Experimental and Theoretical Program. AD-A161 994
	A Birth and Death Process Approximation for the Slotted ALOHA Algorithm.	*ROWCLIFFE, DAVID J. * * *
		Silicon Nitride Joining. AD-A162 337

PERSONAL AUTHOR INDEX-21  
UNCLASSIFIED EVK551

RAM-ROW

*ROWE, L. A Generalized DBMS to Support Diverse Data. AD-A162 384	* * *	Aggregation by Dispersion. AD-A161 314	* * *	Buckling of Delaminated Shells and Multi-Annular Plates. AD-A162 371
*ROWE, WILLIAM S. Coupling Linearized Far-Field Boundary Conditions with Nonlinear Near-Field Solutions in Transonic Flow. AD-A162 334	* * *	Terminal Distributions of Rotational Energy in Free Jets of CO and CO <sub>2</sub> . AD-A161 315	* * *	*SALTER, IAN D. Cluster Complex Metathesis. Synthesis, Structures, and Dynamic Behaviour of Bi- and Tri-Metallic Hexanuclear Cluster Complexes (MM'RU4(m)11micron3-H)2(CO)12(PPh3)2) (M = M' = Cu, Ag, or Au; M = Cu, M' = Ag or Au; M = Ag, M' = Au). AD-A162 873
*ROYTBURD, V. Numerical Study of Quenching of Inward Propagating Spherical Flames. AD-A162 501	* * *	*RYALI, SUBBARAO B. Time-Resolved Infrared Emission Studies of CN(2) Formed by CO oxidation on Pt and Pd. AD-A161 166	* * *	*SAMATHAM, M. R. The De Bruijn Multiprocessor Network: A Versatile Sorting Network. AD-A161 509
*RUNGGALDIER, W. Nearly Optimal State Feedback Controls for Stochastic Systems with Wideband Noise Disturbances. AD-A162 271	* * *	*SAEGER, KATHERINE L. On the Time Required to Reach Fully Developed Flow in Pulsed Supersonic Free Jets. AD-A161 283	* * *	*SANKUR, H. Laser Evaporation Studies. AD-A162 346
*RUPPERT, D. A Stochastic Population Model for Managing the Atlantic Menhaden (Brevortia tyrannus) Fishery and Assessing Managerial Risks. AD-A162 112	* * *	*SAHA, H. P. Theory of Excitation Transfer between Rydberg Atoms. AD-A162 986	* * *	*SATHYAMOORTHY, M. Nonlinear Analysis and Optimal Design of Dynamic Mechanical Systems for Spacecraft Application. AD-A162 194
*RUPPERT, DAVID M-Estimation for Discrete Data. Asymptotic Distribution Theory and Implications. AD-A162 779	* * *	Recent Advances in the Theory of Chem-Ionization. AD-A163 126	* * *	*SCHETZ, JOSEPH A. Combustor/Inlet Interactions and Modeling of Hypersonic Dual Combustor Ramjet Engines. AD-A162 111
*RYALI, S. B. Distribution of Internal Energy in CO and CO <sub>2</sub> Vibrationally Excited by a Hot Platinum Surface. AD-A161 224	* * *	Electrochemical Oxidation of Some Metal Carbonyls in Ambient Temperature Ionic Liquids. AD-A161 168	* * *	*SCHILLING, DONALD L. Spread Spectrum Acquisition and Tracking. AD-A162 442
*SALIER, IAN D. Cluster Complex Metathesis. Synthesis, Structures, and Dynamic Behaviour of Bi- and Tri-Metallic Hexanuclear Cluster Complexes (MM'RU4(m)11micron3-H)2(CO)12(PPh3)2) (M = M' = Cu, Ag, or Au; M = Cu, M' = Ag or Au; M = Ag, M' = Au). AD-A162 873	* * *	*SALLAM, SAYED Delamination Buckling and Growth of Flat Composite Structural Elements. AD-A162 370	* * *	*SCHILLOWITZ, ALAN M. Collisional Deactivation of

PERSONAL AUTHOR INDEX-22  
UNCLASSIFIED EVK551

ROW - SCH

UNCLASSIFIED

- K(5(2)P(J)) by H(2). Identification of the Primary Quenching Channel, AD-A162 903
- \*SCHMIDHAMMER, J. \* \* \*  
Effect of Additional Variables in Principal Component Analysis, Discriminant Analysis and Canonical Correlation Analysis. AD-A162 069
- \*SCHMIDT, MICHAEL W. \* \* \*  
Electronic Structure of the Phosphoryl and Thiophosphoryl Bonds, AD-A162 809
- \* \* \*  
The Intrinsic Reaction Coordinate and the Rotational Barrier in Silaethylene, AD-A162 922
- \*SCHMIDT, WERNER F. \* \* \*  
Electrical and Optical Studies of Chemically Synthesized Polypyrrole, AD-A162 894
- \*SCHNEIDER, HELMUT \* \* \*  
A Note on Levene's Tests for Equality of Variances, AD-A161 377
- \*SCONING, JAMES \* \* \*  
Efficiency Loss with the Kaplan-Meier Estimator, AD-A161 341
- \*SEEREERAM, DEVO \* \* \*  
Generalized Phenomenological Cyclic Stress-Strain-Strength Characterization of Anisotropic Granular Media, AD-A162 348
- \*SELAWOGLU, N. \* \* \*
- \*SERVIS, KENNETH L. \* \* \*  
Silicon-29 NMR Studies of Polymethylhydrosiloxanes: Spin-Lattice Relaxation Time (T(1)) Measurements, AD-A162 992
- \*SHAMROTH, STEPHEN J. \* \* \*  
Numerical Simulation of Unsteady Three-Dimensional Turbulent Structures in Boundary Layer Flows, AD-A162 130
- \*SHEAFFER, JOHN D. \* \* \*  
Effects of Mountain Ranges on Mesoscale Systems Development, AD-A161 136
- \*SHEN, RUJIN \* \* \*  
Vertical Interpolation of Meteorological Variables in Low-Resolution Numerical Models, AD-A162 818
- \*SIENKO, M. J. \* \* \*  
Thin Film Synthesis of Superconducting Chemical Compounds, AD-A162 807
- \*SIEVERS, A. J. \* \* \*  
Possibility of Observing Quantum Size Effects in the Electromagnetic Absorption Spectrum of Small Metal Particles, AD-A161 182
- \*SIMITSES, GEORGE J. \* \* \*  
Delamination Buckling and Growth of
- Flat Composite Structural Elements, AD-A162 370
- \* \* \*  
Buckling of Delaminated Shells and Multi-Annular Plates, AD-A162 371
- \*SIMPSON, DOUGLAS G. \* \* \*  
M-Estimation for Discrete Data. Asymptotic Distribution Theory and Implications, AD-A162 779
- \*SINCLAIR, G. B. \* \* \*  
On the Role of Dimensionless Elastic Fracture Mechanics, AD-A161 285
- \*SINH, BIMAL K. \* \* \*  
Optimality Robustness of Tests in Two Population Problems, AD-A162 265
- \*SITZMANN, E. V. \* \* \*  
Singlet-Triplet Interconversion of Diphenylmethylen Energetics, Dynamics and Reactivities of Different Spin States, AD-A162 682
- \*SIVAKUMAR, N. \* \* \*  
Photodissociation Dynamics of Nozzle-Cooled ICN, AD-A161 659
- \* \* \*  
State-Resolved Photofragmentation of OCS Monomers and Clusters, AD-A162 971
- \*SIVASHINSKY, G. I. \* \* \*  
Numerical Study of Quenching of Inward Propagating Spherical Flames, AD-A162 501

PERSONAL AUTHOR INDEX-23  
UNCLASSIFIED EVK551

SCH-SIV

# UNCLASSIFIED

\*SKALAK, F. M. \* \* \*  
Computer-Aided Engineering,  
AD-A162 811

\*SLEMROD, M. \* \* \*  
Non-Linear Systems in Infinite  
Dimensional State Spaces.  
AD-A162 869

\*SMITH, CHARLES B. \* \* \*  
Semiclassical Wave Packet Studies  
of Elastic and Inelastic Atom-  
Surface Scattering from a 3D Model  
Surface.  
AD-A162 692

\*SMYTHE, M. E. \* \* \*  
Phospha-S-Triazines. VIII. Chloro-  
Substituted Diphospha-S-Triazines,  
AD-A161 122

\*SNIR, SHLOMO \* \* \*  
Investigation of Material Problems  
for High Temperature, High Power  
Space Energy-Conversion Systems.  
AD-A162 227

\*SREEKANTA, T. \* \* \*  
Database Design for Structural  
Analysis and Design Optimization.  
AD-A162 355

\*SREEKANTAMURTHY, T. \* \* \*  
Database Management in Design  
Optimization.  
AD-A162 212

\*SRINIVASAN, A. V. \* \* \*  
Study of Characteristics of Dry  
Friction Damping.  
AD-A162 770

\*STAIR, A. T., JR \* \* \*

\* \* \*  
Rocket-Borne Measurements of  
Atmospheric Infrared Fluxes,  
AD-A162 819

\*STALEY, D. T. \* \* \*  
Database Management in Design  
Optimization.  
AD-A162 212

\*STEED, A. J. \* \* \*  
Ground-Based Atmospheric Infrared  
and Visible Emission Measurements.  
AD-A162 930

\*STEELE, EARL L. \* \* \*  
United States Air Force Weapons  
Laboratory Research Scholar  
Program, 1983-1984.  
AD-A161 246

\*STEPHENSON, J. C. \* \* \*  
Vibrational Deactivation of Surface  
OH Chemisorbed on SiO sub 2:  
Solvent Effects,  
AD-A162 803

\* \* \*  
Vibrational Energy Relaxation of  
Adsorbates on Surfaces,  
AD-A162 804

\* \* \*  
Time Resolved Measurements of  
Vibrational Relaxation of Molecules  
on Surfaces: Hydroxyl Groups on  
Silica,  
AD-A162 899

\*STEWART, JAMES R. \* \* \*  
Prediction of Detonation Transition  
in Porous Explosives from Rapid  
Compression Loadings.  
AD-A162 767

\*STOCKBRIDGE, RICHARD D. \* \* \*

Combustor/Inlet Interactions and

Modeling of Hypersonic Dual  
Combustor Ramjet Engines.  
AD-A162 111

\*STONE, F. GORDON A. \* \* \*

Cluster Complex Metathesis.  
Synthesis, Structures, and Dynamic  
Behaviour of Bi- and Tri-Metallic  
Hexanuclear Cluster Complexes  
(MM'Ru4(m111micron3-  
H)2(CO)12(PPH3)2) (M = M' = CU,  
Ag, or Au; M = CU, M' = Ag or Au;  
M = Ag, M' = AU).  
AD-A162 873

\*STONEBRAKER, M. \* \* \*

Request for Instrumentation.  
AD-A161 421

\* \* \*  
A Generalized DBMS to Support  
Diverse Data.  
AD-A162 384

\*STORCH, DONN M. \* \* \*

Alternative View of Enzyme  
Reactions,  
AD-A162 198

\* \* \*  
Can Desolvation of an Ion Be the  
Rate-Determining Step in a  
Reaction?  
AD-A162 297

\*STONE, D. W. \* \* \*

Passive Fiber-Optic Ring Resonator  
for Rotation Sensing.  
AD-A162 943

\*STRIZ, ALFRED G. \* \* \*

Optimization of Tip Store Modeling.  
AD-A162 119

\*SUN, C. T. \* \* \*

Internal Damping of Short-Fiber  
Reinforced Polymer Matrix

PERSONAL AUTHOR INDEX-24  
UNCLASSIFIED EVK551

SKA-SUN

UNCLASSIFIED

- Composites,  
AD-A162 311
- \*SWIATKIEWICZ, JACEK \* \* \*  
Nonlinear Electroacoustic  
Phenomena: Phonon Echo in d-  
Tartaric Acid and Its Salts.  
AD-A161 140 \* \* \*
- Molecular Mechanics of  
Photopolymerization of 2,5-  
Distyrylpyrazine in Solid state,  
AD-A161 317
- \*TADMOR, EITAN \* \* \*  
Convenient Stability Criteria for  
Difference Approximations of  
Hyperbolic Initial-Boundary Value  
Problems,  
AD-A162 284
- \*TAYLOR, HOWARD M. \* \* \*  
The Reliability of Load Sharing  
Systems.  
AD-A162 121
- \*TEKIPPE, V. J. \* \* \*  
Passive Fiber-Optic Ring Resonator  
for Rotation Sensing.  
AD-A162 843
- \*TENNEY, ROBERT R. \* \* \*  
Modeling Electrocardiograms Using  
Interacting Markov Chains.  
AD-A162 758
- \*TEUGELS, JOZEF L. \* \* \*  
Real Inversion Formulas for Laplace  
and Stieltjes Transforms.  
AD-A161 270
- \*TEWARSON, REGINALD P. \* \* \*  
Numerical Methods for Differential  
Equations.
- AD-A162 722
- \*THOMANN, HANS \* \* \*  
Electron Nuclear Double Resonance  
Spectra of Cis-Rich and Trans-Rich  
Polyacetylenes between 1.9 and 4.2  
K,  
AD-A162 818 \* \* \*
- (13)C and (1)H Hyperfine Tensors  
for Polyacetylene Analyzed in Terms  
of PI (-o) Electron Coulombic  
Interactions.  
AD-A162 895
- \*THOMAS, P. D. \* \* \*  
Numerical Generation of 3D  
curvilinear Coordinate Systems and  
Computational Grids for Aircraft  
Configurations.  
AD-A162 248
- \*THOMPSON, DONALD L. \* \* \*  
Monte Carlo Transition-State Study  
of Angular Momentum Effects on the  
Unimolecular Dissociation of CH(4)  
on the Duchovic-Hase-Schlegel ab  
initio Surface.  
AD-A162 218 \* \* \*
- Monte Carlo Random Walk Study of  
Recombination and Desorption of  
Hydrogen on Si(111).  
AD-A162 278
- Theoretical Investigations of the  
CVD (Chemical Vapor Deposition) of  
Silicon from Silane.  
AD-A162 548
- \*TIEN, JOHN K. \* \* \*  
Equipment Acquired by Columbia  
University Center for Strategic  
Materials under DoD University  
Research Instrumentation Program.  
AD-A162 165 \* \* \*
- Understanding the HIP (Hot  
Isostatic Pressing) Consolidation  
of P/M Nickel-Base Superalloys.  
AD-A162 387
- \*TIERSTEN, HARRY F. \* \* \*  
Analytical Investigations of Bulk  
Wave Resonators in the  
Piezoelectric Thin Film on Gallium-  
Arsenide Configuration.  
AD-A162 088
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Moment and Geometric Probability  
Inequalities Arising from  
Arrangement Increasing Functions.  
AD-A161 273 \* \* \*
- Fault Diversity in Software  
Reliability.  
AD-A162 757
- \*TREFONAS, P. \* \* \*  
Organogermane Homopolymers and  
Copolymers with Organosilanes,  
AD-A162 923
- \*TREFONAS, PETER, III \* \* \*  
Organosilane High Polymers:  
Oxidation of  
Polycyclohexylmethylsilylene,  
AD-A162 893
- \*TRIVEDI, KISHOR \* \* \*  
Transient Solution of Acyclic  
Markov Chains.  
AD-A162 314
- \*TRUDELL, RICHARD W. \* \* \*  
Passively Damped Joints for  
Advanced Space Structures.  
AD-A162 257
- \*TRUHLAR, DONALD G. \* \* \*

PERSONAL AUTHOR INDEX-25  
UNCLASSIFIED EVK551

SWI-TRU

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AD-A161 078

\*TURRO, N. J.

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AD-A161 660

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AD-A162 682

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The Role of Intersystem Crossing Steps in Singlet Oxygen Chemistry and Photo-Oxidations,  
AD-A162 310

Carbene and Silicon Routes Toward a Simple Nitrile Ylide. Spectroscopic, Kinetic, and Chemical Characterization,  
AD-A162 928

Nanosecond Flash Photolysis Studies of Intersystem Crossing Rate Constants in Biradicals: Structural Effects Brought about by Spin Orbit Coupling,  
AD-A162 948

Magnetic Field Effect on the Intersystem Crossing Rate Constants of Biradicals Measured by Nanosecond Transient UV Absorption,  
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\*ULWICK, J. C.

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AD-A162 819

\*VANDERSALL, MARK

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AD-A162 892

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AD-A161 216

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AD-A161 315

\*VISWANATHAN, R.

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AD-A162 218

\*WADEHRA, J. M.

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AD-A163 065

\*WADSWORTH, CYNTHIA L.

Factors Influencing the Magnitude of Alpha-13C Hyperfine Couplings in Cyclooctane Anion Radicals,  
AD-A162 906

ESR (Electron Spin Resonance) Spectra for Anion Radicals of Alkylcyclooctatrilanes and Cyclopentasilanes,  
AD-A162 919

\*WAGNER, R. A.

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AD-A162 141

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\*WALTRUP, PAUL J.

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\*WAN, J. K. S.

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\*WANEK, ERICH

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AD-A162 073

\*WARE, G. A.

Ground-Based Atmospheric Infrared and Visible Emission Measurements.  
AD-A162 930

\*WATANABE, HAMAO

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AD-A162 919

\*WAZER, JOHN R.

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AD-A162 817

\*WEBER, WILLIAM P.

PERSONAL AUTHOR INDEX-26  
UNCLASSIFIED EVK551

TUR-WEB

UNCLASSIFIED

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Adamantylidimethylsilyl Ethers,  
AD-A162 073
- \* \* \*  
Unsaturated Reactive Intermediates  
in Organosilicon Chemistry - Recent  
Results,  
AD-A162 917
- \* \* \*  
Titanium Tetrachloride Promoted  
Reactions of Allylic  
Trimethylsilanes and Oxetane,  
AD-A162 951
- \* \* \*  
Silicon-29 NMR Studies of  
Polymethylhydrosiloxanes: Spin-  
Lattice Relaxation Time (T<sub>1</sub>)  
Measurements,  
AD-A162 992
- \* \* \*  
Zinc Iodide Catalyzed Reaction of  
Oxetanes with Trimethylsilyl  
Cyanide,  
AD-A163 064
- \* WERON, ALEKSANDER \* \* \*  
Innovations and Mold Decompositions  
of Stable Sequences,  
AD-A161 437
- \* WERT, BARBARA J. \* \* \*  
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Report Summaries,  
AD-A162 372
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ENDOR Studies of Cyclopentasilane  
Radical Anions,  
AD-A162 248
- \* \* \*  
Organogermane Homopolymers and  
Copolymers with Organosilanes,  
AD-A162 923
- \* WEST, ROBERT \* \* \*  
K(5(2)P(J)) by H(2). Identification  
of the Primary Quenching Channel,  
AD-A162 903
- \* WILKINS, DAVID E. \* \* \*  
Research on Problem-Solving  
Systems,  
AD-A162 095
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AD-A162 433
- \* WILLISKY, ALAN S. \* \* \*  
Modeling Electrocardiograms Using  
Interacting Markov Chains,  
AD-A162 758
- \* \* \*  
The Reduction of Perturbed Markov  
Generators: An Algorithm Exposing  
the Role of Transient States,  
AD-A162 773
- \* WILMERT, K. D. \* \* \*  
Nonlinear Analysis and Optimal  
Design of Dynamic Mechanical  
Systems for Spacecraft Application,  
AD-A162 194
- \* WILSON, D. C. \* \* \*  
Applications of Differential  
Topology to Grid Generation,  
AD-A162 834
- \* WINEFORDNER, J. D. \* \* \*  
Atomic and Molecular Gas Phase  
Spectrometry,  
AD-A162 339
- \* WINOGRAD, N. \* \* \*  
Reduction of Nitric Oxide on the  
Carbon Pretreated Rh(331) Single  
Crystal Surface. Evidence for  
Molecular Cn - Formation,
- Kinetics of Thermal Cis-Trans  
Isomerizations in Disilenes,  
AD-A162 350
- \* \* \*  
Synthesis of a 1,3-Dioxo-2,4-  
diborethane: An Oxoborane Precursor,  
AD-A162 497
- \* \* \*  
Organosilane High Polymers:  
Oxidation of  
Polycyclohexylmethylsilylene,  
AD-A162 893
- \* \* \*  
Factors Influencing the Magnitude  
of Alpha-13C Hyperfine Couplings in  
Cyclosilane Anion Radicals,  
AD-A162 906
- \* \* \*  
Organosilane Polymers: Formable  
Copolymers Containing  
Diphenylsilylene Units,  
AD-A162 907
- \* \* \*  
ESR (Electron Spin Resonance)  
Spectra for Anion Radicals of  
Alkylcyclooctasilanes and  
Cyclopentasilanes,  
AD-A162 919
- \* \* \*  
Convenient Syntheses of  
Dodecamethylcyclohexasilane and  
Decamethylcyclopentasilane,  
AD-A163 123
- \* WHITNEY, A. K. \* \* \*  
Numerical Generation of 3D  
curvilinear Coordinate Systems and  
Computational Grids for Aircraft  
Configurations,  
AD-A162 249
- \* WICKS, G. W. \* \* \*  
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Materials, Devices and Circuits,  
AD-A162 021
- \* WIESENFIELD, JOHN R. \* \* \*  
Collisional Deactivation of

PERSONAL AUTHOR INDEX-27  
UNCLASSIFIED EVK551

WER-WIN

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AD-A161 226 \* \* \*
- Adsorption and Desorption of NO from Rh(111) and Rh(331) Surfaces.  
AD-A162 831 \* \* \*
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AD-A162 872 \* \* \*
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A Study of Error Detection and Correction Codes.  
AD-A162 196 \* \* \*
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Clustering and Ordering in III-V alloys.  
AD-A161 099 \* \* \*
- \*WOLFF, P. A. \* \* \*  
Infrared Nonlinear Processes in Semiconductors.  
AD-A162 098 \* \* \*
- \*WONG, E. \* \* \*  
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AD-A162 384 \* \* \*
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AD-A162 021 \* \* \*
- \*WOOLF, LAWRENCE D. \* \* \*  
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AD-A162 098 \* \* \*
- AD-A161 987  
\*YAGLE, ANDREW E. \* \* \*  
The Shur Algorithm and Its Applications.  
AD-A161 011 \* \* \*
- \*YATES, J. T., JR. \* \* \*  
Surface Bonding of the NH<sub>3</sub> and NH<sub>2</sub> Species to Ni(110).  
AD-A162 270 \* \* \*
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Plasma Deposition of Silicon Carbide Thin Films.  
AD-A161 275 \* \* \*
- \*YEAGER, DAVID M. \* \* \*  
Study in Spurious Sensitivity of Electronics in Space.  
AD-A162 300 \* \* \*
- \*YEH, K. C. \* \* \*  
Ordered Carbon - Metal Alloys for Extraterrestrial Power Systems.  
AD-A162 287 \* \* \*
- \*YIN, Y. Q. \* \* \*  
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AD-A161 059 \* \* \*
- \*YUAN, JIAN-MIN \* \* \*  
Quantum Statistical Theory of Vibrational Dynamics in a Laser-Driven Admolecule-Surface System.  
AD-A163 058 \* \* \*
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Infrared Nonlinear Processes in Semiconductors.  
AD-A162 098 \* \* \*
- \*ZARE, RICHARD N. \* \* \*  
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AD-A162 972 \* \* \*
- \*ZHANG, XING-HUA \* \* \*  
Organosilane Polymers: Formable Copolymers Containing Diphenylsilylene Units.  
AD-A162 907 \* \* \*
- \*ZHAO, L. C. \* \* \*  
On Detection of Number of Signals in Presence of Colored Noise Using Information Theoretic Criteria.  
AD-A161 847 \* \* \*
- \*ZHAO, LIN-CHENG \* \* \*  
An Inequality Concerning the Deviation between Theoretical and Empirical Distributions.  
AD-A162 169 \* \* \*
- \*ZIMMT, M. B. \* \* \*  
The Observation of CIDEP (Chemically Induced Dynamic Electron Polarization) from the Photodecomposition of Dibenzy Ketone in Micellar Solution.  
AD-A161 660 \* \* \*
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Nanosecond Flash Photolysis Studies of Intersystem Crossing Rate Constants in Biradicals: Structural Effects Brought about by Spin Orbit Coupling.  
AD-A162 948 \* \* \*
- Magnetic Field Effect on the Intersystem Crossing Rate Constants of Biradicals Measured by

PERSONAL AUTHOR INDEX-28  
UNCLASSIFIED  
EVK55I

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Nanosecond Transient UV Absorption,  
AD-A162 984

PERSONAL AUTHOR INDEX-29  
UNCLASSIFIED EVK551

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# ABSTRACTS

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-8088 981L 11/2 11/4

AD-A183 128 7/5 20/10

BABCOCK AND WILCOX CO LYNCHBURG VA

ROCHESTER UNIV NY DEPT OF CHEMISTRY

(U) A New Process for Final Densification of Ceramics.

(U) Recent Advances in the Theory of Chem-Ionization.

DESCRIPTIVE NOTE: Quarterly rept..

85 20P

JUN 85 24P

PERSONAL AUTHORS: Saha, H. P.; Lam, Kai-Shue; George, Thomas F.;

PERSONAL AUTHORS: Wagner, R. A.;

CONTRACT NO. F49620-85-C-0053, ARPA Order-5172

REPORT NO. 82

CONTRACT NO. AFOSR-82-0048

MONITOR: AFOSR  
TR-85-0918

PROJECT NO. 2303

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EXPORT CONTROL

TASK NO. B3

MONITOR: AFOSR  
TR-85-1187

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Distribution: Further dissemination only as directed by Air Force Office of Scientific Research, Bldg 410, Bolling AFB, DC 20332-6448, 15 Oct 85, or higher DoD authority. This document contains export-controlled technical data.

SUPPLEMENTARY NOTE: Original contains color plates: All DTIC & NTIS reproductions will be in black and white.

SUPPLEMENTARY NOTE: Pub. in Gas-Phase Chemiluminescence and Chemi-Ionization, p87-104 1985.

DESCRIPTORS: (U) \*IMPREGNATION, \*CERAMIC MATERIALS, \*SUPERFLUIDITY, CARBON, CARBON CARBON COMPOSITES, CARBON DIOXIDE, COMPOSITE MATERIALS, FLUIDS, GASES, HIGH TEMPERATURE, INTERFACIAL TENSION, MORPHOLOGY, ORGANOMETALLIC COMPOUNDS, POROSITY, POROUS MATERIALS, PRESSURE, PRESSURE VESSELS, PROCESSING, PROPANE, PYROLYSIS, SOLUBILITY, STRUCTURES, TEST METHODS, DENSITY

ABSTRACT: (U) A review of experimental results for collisional ionization in a laser field is presented. Both quantum mechanical and semiclassical theories which are capable of describing such results are discussed. A specific problem in the theory of chemi-ionization with or without a laser field, namely the nonlocality of the scattering potential, is addressed for the case of associative ionization.

IDENTIFIERS: (U) \*Supercritical fluids processing.  
\*Densification, PE81102F, WUAFOSR2303A3

DESCRIPTORS: (U) \*PHOTOIONIZATION, LASER APPLICATIONS, VAPOR PHASES, QUANTUM THEORY, SCATTERING, COLLISIONS, PHOTODISSOCIATION, REPRINTS

IDENTIFIERS: (U) WUAFOSR2303B3, PE81102F

AD-8088 981L

AD-A183 128

UNCLASSIFIED

PAGE 1

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A163 125 CONTINUED

STANFORD UNIV CA DEPT OF CHEMISTRY

(U) Statistical Thermodynamics of Semirigid Macromolecules:  
Chains with Interconvertible Rodlike and Random-Coil  
Sequences in Equilibrium,

IDENTIFIERS: (U) WUAFOSR2303A2, PE811202F

84 8P

PERSONAL AUTHORS: Flory, P. J.; Matheson, R. R., Jr.;

CONTRACT NO. AFOSR-82-0009

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-85-1162

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Physical Chemistry,  
v88 n26 p6806-6812 1984.

ABSTRACT: (U) Expressions are developed for the free energy of binary isotropic and nematic solutions in which the solute is a polymer chain capable of assuming either rodlike or random-coil conformations which are in equilibrium. A marked enhancement of the propensity to adopt the rodlike conformation accompanies formation of a nematic phase from an isotropic mixture. This follows from the tendency virtually to exclude random-coil conformations from the ordered phase, in agreement with earlier investigations on separate rodlike and random-coil chains. Expressions for the chemical potentials of the components in the isotropic and the fully helical, nematic phases are obtained. Phase diagrams that illustrate the general dependence of the binodals on molecular parameters are constructed. The profound shift in the conformational equilibria incident to the formation of a nematic phase, although most marked in the case of a discrete helix-coil transition, must be prevalent in other systems as well.

DESCRIPTORS: (U) \*POLYMERS, MACROMOLECULES, \*MOLECULAR STRUCTURE, \*THERMOCHEMISTRY, THERMODYNAMICS, STATISTICAL DATA, RIGIDITY, PHASE DIAGRAMS, HELICES, COILS, EQUILIBRIUM(GENERAL), SOLUTES, REPRINTS

AD-A163 125

AD-A163 125

UNCLASSIFIED

PAGE

2

EVK551

## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A163 123 7/3

AD-A163 111 7/4

WISCONSIN UNIV-MADISON DEPT OF CHEMISTRY

ILLINOIS INST OF TECH CHICAGO DEPT OF CHEMISTRY

(U) Convenient Syntheses of Dodecamethylcyclohexasilane  
and Decamethylcyclopentasilane,

(U) The A' 3P<sub>1</sub>(2 sub u)-X 1 Sigma (+) sub g Emission  
Spectrum of Br<sub>2</sub> in an Argon Matrix,

JUL 85 3P

APR 85 7P

PERSONAL AUTHORS: Chen, San-Mei ; Katti, Anita ; Blinka,  
Thomas A. ; West, Robert ;

PERSONAL AUTHORS: Nicolai, Jean-Philippe ; Burgt, Lambertus  
J. van de ; Heaven, Michael C. ;

CONTRACT NO. F49620-83-C-0044

CONTRACT NO. AFOSR-83-0173

PROJECT NO. 2303

PROJECT NO. 2303

TASK NO. 82

TASK NO. 82

MONITOR: AFOSR  
TR-85-1197

MONITOR: AFOSR  
TR-85-1169

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Synthesis, p684-686 Jun/Jul  
85.

SUPPLEMENTARY NOTE: Pub. in Chemical Physics Letters,  
v115 n6 p496-500, 19 Apr 85.

ABSTRACT: (U) Dodecamethylcyclohexasilane (1) is  
obtained in 80% yield by the reaction of  
dimethyldichlorosilane with lithium in THF at 0C, in the  
presence of 1,1,1-trimethyltriphenyl-disilane as a  
catalyst. Photolysis of 1 in a mixture of pentane and  
triethylsilane produces decamethylcyclopentasilane,  
isolated in 44% yield.

ABSTRACT: (U) The emission spectrum of the A'Superscript  
3 P<sub>1</sub>(2 sub u)-X superscript 1 sigma sub g (+) system of  
Br<sub>2</sub> in argon matrix is reported. The vibrationally  
resolved spectra have been analysed and two possible  
vibrational numberings have been determined. These  
provide estimates for T sub e of 12988 + or - 8 and 12679  
+ or - 8/cm, respectively. Excitation spectra have been  
examined, and these provide insight into the excitation  
and relaxation mechanisms present in the matrix.

DESCRIPTORS: (U) \*SYNTHESIS(CHEMISTRY), \*SILANES,  
\*CYCLIC COMPOUNDS, \*METHYL RADICALS, REACTANTS(CHEMISTRY),  
CHLOROSILANES, PHENYL RADICALS, LITHIUM, CATALYSTS,  
PHOTOLYSIS, PENTANES, REPRINTS

DESCRIPTORS: (U) \*BROMINE, \*EMISSION SPECTRA,  
VIBRATIONAL SPECTRA, ELECTRONIC STATES, EXCITATION,  
RELAXATION, ELECTRON SPECTROSCOPY, ARGON, REPRINTS

IDENTIFIERS: (U) Silane/dodecamethylcyclohexa, Silane/  
decamethylcyclopenta, WUAFOSR2303B2, PE61102F

IDENTIFIERS: (U) Matrix isolation, WUAFOSR2303B2,  
PE61102F

AD-A163 123

AD-A163 111

UNCLASSIFIED

PAGE 3 EVK551

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A163 095

12/1

AD-A163 065 20/8 7/2

## ILLINOIS UNIV AT CHICAGO CIRCLE

WAYNE STATE UNIV DETROIT MICH DEPT OF PHYSICS

(U) Combining Experiments under Gauss-Markov Models.

(U) Dissociative Electron Attachment to Rovibrationally Excited Molecules.

SEP 85 9P

PERSONAL AUTHORS: Hedayat, A. S.; Majumdar, Dibyen;

DESCRIPTIVE NOTE: Annual technical rept. no. 1, 1 Aug 84-30 Sep 85,

CONTRACT NO. AFOSR-80-0170

SEP 85 11P

PROJECT NO. 2304

PERSONAL AUTHORS: Wadehra, J. M.;

TASK NO. A5

CONTRACT NO. AFOSR-84-0143

MONITOR: AFOSR

PROJECT NO. 2301

TR-85-1114

TASK NO. A7

MONITOR: AFOSR

TR-85-1133

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of American Statistical Association, v80 n381 p698-703 Sep 85.

UNCLASSIFIED REPORT

ABSTRACT: (U) This reprint considers a classical Gauss-Markov model where  $\phi$  consists of the parameters of interest, and  $\psi$  the nuisance parameters. Here  $I$  denotes the identity matrix. The purpose of this article is to study how information increases where two experiments are combined and to gain a clear understanding of this increase in terms of the BLUE's and their variances. Keywords: information matrix.

DESCRIPTORS: (U) \*MATHEMATICAL MODELS, PARAMETERS, MATRICES(MATHEMATICS), VARIATIONS, REPRINTS

IDENTIFIERS: (U) Gauss Markov method, PE81102F, WUAFOSR2304A5

ABSTRACT: (U) The aim of this project is to investigate the dependence of the cross sections for dissociative electron attachment to a molecule on the initial rovibrational state of the molecule. An enhancement of the cross section results in the enhancement of the rate of production of negative ion beams. Preliminary investigations reveal that for lithium dimers,  $Li(2)$ , the peak attachment cross sections can increase by almost an order of magnitude if the molecule is initially vibrationally excited to the  $v = 1$  level. Excitation to higher vibrational levels would result in further enhancement of the attachment rates. As part of present investigations, the cross sections for vibrational excitation of various molecules, using both resonant and nonresonant mechanisms is calculated.

DESCRIPTORS: (U) \*IONIZATION, \*DIATOMIC MOLECULES, \*ION BEAMS, CHEMICAL DISSOCIATION, ATTACHMENT, ELECTRONS, MOLECULAR STATES, MOLECULAR ROTATION, MOLECULAR VIBRATION, EXCITATION, LITHIUM, CROSS SECTIONS, ANIONS, RATES, MOLECULES, DIMERS, VIBRATION, PEAK VALUES

IDENTIFIERS: (U) WUAFOSR2301A7, PE81102F

AD-A163 095

AD-A163 085

UNCLASSIFIED

PAGE

4

EVK551

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

## SEARCH CONTROL NO. EVK551

AD-A163 084

7/4

UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES LOKER  
HYDROCARBON RESEARCH INST

AD-A163 083

4/2

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION GREENBELT  
MD GODDARD SPACE FLIGHT CENTER(U) Zinc Iodide Catalyzed Reaction of Oxetanes with  
Trimethylsilyl Cyanide,

85

10P

PERSONAL AUTHORS: Carr, Steve A. ; Weber, William P. ;

CONTRACT NO. AFOSR-82-0333

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-85-1170

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Synthetic Communications, v15  
n9 p775-781 1985.ABSTRACT: (U) Oxetanes react regiospecifically with  
trimethylsilyl cyanide under zinc iodide catalysis to  
give high yields of 3-trimethylsiloxypropyl isocyanides.  
(Author)DESCRIPTORS: (U) \*CATALYSIS, \*IODIDES, \*ZINC, \*OXETANES,  
CYANIDES, YIELD, RESPONSE, REPRINTS

IDENTIFIERS: (U) WJAFOSR, PEB1102F

AD-A163 084

## UNCLASSIFIED

PAGE 5 EVK551

(U) Transverse Ageostrophic Circulations Associated with  
Elevated Mixed Layers,

DEC 84 14P

PERSONAL AUTHORS: Keyser, Daniel ; Carlson, Toby N. ;

CONTRACT NO. AFOSR-ISSA-84-00012

PROJECT NO. 2310

TASK NO. A1

MONITOR: AFOSR  
TR-85-1174

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Monthly Weather Review, v112  
n12 p2465-2478 Dec 84.ABSTRACT: (U) An elevated mixed layer is a principal  
component of the conceptual model recently proposed by  
Carlson and others to explain the evolution of a severe  
storm environment over the Southern Plains of the United  
States during springtime. Elevated mixed layers are most  
likely to be found downwind of strongly heated arid land  
areas (often plateaus), which favor the growth of a deep  
mixing layer with high potential temperature. The lower  
and lateral boundaries of elevated mixed layers are  
distinctly defined respectively by a statically stable  
layer, referred to as a lid inversion, and a midlevel  
front. These boundaries mark the zoned of transition  
between the airstream defining the elevated mixed layer  
and other airstreams of differing geographical origin and,  
consequently, thermodynamic properties. In this study,  
the Sawyer-Eliassen secondary circulation equation is  
used to diagnose the transverse ageostrophic circulations  
that are associated with the dynamical forcing implied by  
the above conceptual model of the elevated mixed layer  
structure. The diagnoses are based upon subjective  
analyses of the elevated mixed layer identified in the  
SESAME IV dataset at 2100 GMT 9 May 1979 and upon  
analytically specified patterns reproducing many of the  
main features of the subjective analyses.

AD-A163 083

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A163 063 CONTINUED

AD-A163 058 9/1 12/1

ROCHESTER UNIV NY DEPT OF CHEMISTRY

DESCRIPTORS: (U) \*THUNDERSTORMS, \*ATMOSPHERIC PHYSICS, REPRINTS, MODELS, MIXING, LAYERS, STRUCTURAL PROPERTIES, ARID LAND, PLATEAUS, THERMODYNAMIC PROPERTIES, HIGH TEMPERATURE, STABILITY, UNITED STATES

(U) Quantum Statistical Theory of Vibrational Dynamics in a Laser-Driven Admolecule-Surface System.

JUN 85 9P

IDENTIFIERS: (U) Mixing layers, WUAFOSR2310A1, PE61102F

PERSONAL AUTHORS: Huang, Xi-Yi ; George, Thomas F. ; Yuan, Jian-Min ;

REPORT NO. 63

CONTRACT NO. AFOSR-82-0046

PROJECT NO. 2303

TASK NO. 83

MONITOR: AFOSR  
TR-85-1147

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Supersedes AD-A152 022. Pub. in Jnl. of the Optical Society of America B, v2 n6 p985-992 Jun 85.

ABSTRACT: (U) A quantum statistical theory for a laser-driven anharmonic oscillator coupled to a system of many degrees of freedom by means of energy and phase dissipative mechanism is presented. The theory is applied to the description of vibrational dynamics in an admolecule-surface system, which are associated with desorption/dissociation processes. It is found that phase relaxation plays an important role in assisting the laser driving force to overcome the anharmonicity and/or detuning bottleneck. It is also shown that a shorter duration of the laser pulse is more efficient for depositing photon energy into the admolecule-system.

DESCRIPTORS: (U) \*ANHARMONIC OSCILLATORS, \*QUANTUM THEORY, \*STATISTICS, DEGREES OF FREEDOM, LASERS, DRIVES(ELECTRONICS), RELAXATION, DESORPTION, DISSOCIATION, PULSED LASERS, DISSIPATION, ENERGY, PHOTONS, VIBRATION, DYNAMICS, REPRINTS

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B3

AD-A163 063

AD-A163 058

UNCLASSIFIED

PAGE 8 EVK551



## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

## SEARCH CONTROL NO. EVK551

AD-A163 011

7/4

ROCHESTER UNIV NY DEPT OF CHEMISTRY

(U) Neutralization and Excitation in Low-Energy Ion-Surface Collisions,

AUG 85 20P

PERSONAL AUTHORS: Lee, Hal W. ; George, Thomas F. ;

REPORT NO. 86

CONTRACT NO. N00014-80-C-0472, AFOSR-82-0048

PROJECT NO. 2302

TASK NO. 83

MONITOR: AFOSR  
TR-85-1148

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Surface Science, v159 n1 p214-232 Aug 85. Supersedes Rept. no. UROCHESTER/DC/85/TR-58, AD-A151 568.

ABSTRACT: (U) A model is presented which describes neutralization and excitation occurring in low-energy ion-surface collisions. Important processes that determine experimentally measurable quantities such as charged fraction  $f^+$  and photon yield gamma are assumed to be Auger neutralization, electronic excitation and radiationless deexcitation. The model yields  $f^+$  and gamma in good agreement with experimental data, although  $\log f^+$  and  $\log$  gamma are found to exhibit nonlinear dependence on the inverse velocity of the incident ion beam.

Keywords: Ion neutralization; Ion-surface collisions; Low energy; Model for experimental data; Charged fraction; Photon field; Reprints.

DESCRIPTORS: (U) \*NEUTRALIZATION, \*AUGER ELECTRON SPECTROSCOPY, \*FLUORINE, COLLISIONS, ELECTRONS, EXCITATION, INVERSION, ION BEAMS, IONS, LOW ENERGY, MEASUREMENT, PHOTONS, REPRINTS, SURFACES, VELOCITY, SURFACE CHEMISTRY

IDENTIFIERS: (U) Ion molecule interactions, PE61102F, WUAFOSR230283

AD-A163 011

UNCLASSIFIED

AD-A163 010 20/5

ROCHESTER UNIV NY DEPT OF CHEMISTRY

(U) Theory of Laser-Stimulated Surface Processes. II. A Generalized Master-Equation Approach to Energy Transfer between an IR Laser, an Adspecies, and Phonons,

SEP 85 10P

PERSONAL AUTHORS: Berl, A. C. ; George, Thomas F. ;

REPORT NO. 88

CONTRACT NO. N00014-80-C-0472, AFOSR-82-C-0472

PROJECT NO. 2303

TASK NO. 83

MONITOR: AFOSR  
TR-85-1149

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v83 n5 p2482-2490, 1 Sep 85. Supersedes Rept. no. UROCHESTER/DC/82/TR-60, AD-A153 083.

ABSTRACT: (U) The time evolution of the vibrational states of an adspecies-surface bond (adbond) excited by IR laser radiation and coupled to phonon modes of the solid is obtained by numerical solution of a generalized master equation. For three levels of a system composed of an atom adsorbed at the end of a linear chain, the average adbond energy is seen to have a monotonic and oscillatory component. Under certain resonance conditions, energy is continuously adsorbed by the adbond from both the laser and the phonons. The Markovian approximation is shown to be inappropriate for this case, and a measure of non-Markovian behavior is proposed. Feedback and synergistic effects are discussed. Keywords: Laser-excited adspecies; Phonon modes; Generalized master equation; Average adbond energy; Non-markovian behavior; Energy feedback effects; and Reprints.

DESCRIPTORS: (U) \*INFRARED LASERS, ENERGY TRANSFER, LASER BEAMS, EQUATIONS, PHONONS, REPRINTS, SYNERGISM, ENERGY, FEEDBACK, STIMULATION(GENERAL), SURFACES, MARKOV

AD-A163 010

PAGE 7 EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A163 010 CONTINUED

AD-A162 992 20/8 7/4

PROCESSES, NUMERICAL ANALYSIS, SOLUTIONS(GENERAL),  
RESONANCE

UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES DEPT OF  
CHEMISTRY

IDENTIFIERS: (U) PE81102F, WJAFOSR230383

(U) Silicon-29 NMR Studies of Polymethylhydrosiloxanes:  
Spin-Lattice Relaxation Time (T<sub>1</sub>) Measurements,

85 6P

PERSONAL AUTHORS: Pai, Yi-Ming ; Weber, William P. ; Servis,  
Kenneth L. ;

CONTRACT NO. AFOSR-82-0333

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-85-1171

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Organometallic  
Chemistry, v288 p269-273, 1985.

ABSTRACT: (U) The high structural sensitivity of  
chemical shifts makes silicon-29 NMR a powerful tool for  
determination of the structure of oligomeric and  
polymeric siloxanes. Detailed information can be obtained  
for the characterization of the different structural  
units, for the determination of average chain lengths or  
for the degree of condensation of the siloxane framework.  
29SiNMR spectra of polymethylhydrosiloxanes, MeSiO(MeHSiO)  
nSiMe3 from n = 3 to 8 and 35, have been determined. Both  
chemical shifts and spin-lattice relaxation times (T<sub>1</sub> sub  
1) have been measured. The stereochemistry at the  
adjacent chiral MeHSiO unit influences the nearest  
neighbor 29Si chemical shift. The effect of chain length  
and position of MeHSiO units on T<sub>1</sub> sub 1 values for  
Me3SiO(MeHSiO)nSiMe3 systems are discussed.

DESCRIPTORS: (U) \*RELAXATION TIME, \*NUCLEAR MAGNETIC  
RESONANCE, \*POLYMERS, \*SILOXANES, CONDENSATION, SILOXANES,  
CHEMICAL SHIFTS, DETERMINATION, CHEMICAL SHIFTS,  
SENSITIVITY, STEREOCHEMISTRY, SPIN STATES, LATTICE  
DYNAMICS, EQUILIBRIUM(GENERAL), ELECTRONIC STATES, DECAY,  
MOLECULAR STRUCTURE, REPRINTS

AD-A163 010

AD-A162 992

UNCLASSIFIED

PAGE 8 EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 992 CONTINUED

AD-A162 991 17/9 4/1

IDENTIFIERS: (U) PE61102F, WUAFOSR230382

CONTROL DATA CORP MINNEAPOLIS MN

(U) Doppler Radar Measurements of Turbulence in the Clear Air.

85 5P

PERSONAL AUTHORS: Nastrom, G. D. ; Gage, K. S. ; Ecklund, W. L.

CONTRACT NO. F49620-82-C-0029

PROJECT NO. 2310

TASK NO. A1

MONITOR: AFOSR  
TR-85-1189

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Symposium on Turbulence and Diffusion (7th) p35-38, 12-15 Nov 85.

ABSTRACT: (U) It has been found that there is a strong connection between gravity wave activity and background wind. Earlier work showed that day-to-day variations in the standard deviation of vertical velocity at tropopause altitudes are well correlated with background wind especially at lower tropospheric altitudes. This work shows that changes in the refractivity turbulence structure constant, correlate well with changes in both the standard deviation of vertical velocity and wind speed. An explanation for these features is that wind flowing over rough terrain is a major source of waves that propagate to higher levels and that waves propagating vertically through a height varying wind field break preferentially at a height of maximum wind (i.e., near the tropopause). Keywords include: Doppler radar; and Turbulence. (Reprints)

DESCRIPTORS: (U) \*WIND, \*TURBULENCE, \*TROPopause, \*DOPPLER RADAR, \*WIND VELOCITY, BACKGROUND, HEIGHT, CONSTANTS, REFRACTION, STRUCTURAL PROPERTIES, ROUGHNESS, TERRAIN, STANDARD DEVIATION, ALTITUDE, AIR, MEASUREMENT, LOW ALTITUDE, REPRINTS, SOURCES, WAVES, TURBULENCE, VELOCITY, VERTICAL ORIENTATION

AD-A162 992

AD-A162 991

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 991 CONTINUED

AD-A162 989 14/5

IDENTIFIERS: (U) PE61102F, WUAFOSR2310A1

CARNEGIE-MELLON UNIV PITTSBURGH PA DEPT OF ELECTRICAL  
AND COMPUTER ENGINEERING

(U) Computer Generated Holograms in Pattern Recognition: A  
Review,

OCT 85 9P

PERSONAL AUTHORS: Casasent, David ;

CONTRACT NO. AFOSR-85-0293

PROJECT NO. 2304

TASK NO. A7

MONITOR: AFOSR  
TR-85-1118

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Optical Engineering, v24 n5  
p724-730 Sep/Oct 85.

ABSTRACT: (U) Holographic optical elements and computer-generated holograms (CGHs) offer many attractive properties and uses. In this review, we consider the use of holography in pattern recognition, with specific attention to recent work with CGH elements. Subject terms: holography; chord distribution; computer-generated hologram; coordinate transformation; correlator; feature extractor; Fourier coefficient; holographic optical element; moment; optical pattern recognition; Sobel transform; space-variant transform; Reprints.

DESCRIPTORS: (U) \*HOLOGRAMS, COEFFICIENTS, COMPUTER APPLICATIONS, COMPUTERS, COORDINATES, DISTRIBUTION, FOURIER ANALYSIS, HOLOGRAPHY, OPTICAL EQUIPMENT COMPONENTS, PATTERN RECOGNITION, REPRINTS, TRANSFORMATIONS(MATHEMATICS)

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A7

AD-A162 991

AD-A162 989

UNCLASSIFIED

PAGE 10 EVK551

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 988

7/4

ROCHESTER UNIV NY DEPT OF CHEMISTRY

(U) Theory of Excitation Transfer between Rydberg Atoms,

MAY 85 15P

PERSONAL AUTHORS: Saha, H. P.; George, Thomas F.;

CONTRACT NO. AFOSR-82-0048

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR  
TR-85-1150

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Molecular Physics, v55 n1  
p173-186 May 85.

ABSTRACT: (U) A quantal theory of laser-induced Penning and associative ionization is extended to field-free excitation transfer processes between Rydberg atoms, where an appropriate local potential approximation is applied. Formulae for total and differential cross sections are presented. Cross section formulae which are specific to a semiclassical description of the heavy-particle motion are also constructed. Keywords: Molecular collisions; Excitation transfer; Rydberg atoms; Quantal theory; Semiclassical theory; Local approximation; Reprints.

DESCRIPTORS: (U) \*ENERGY TRANSFER, IONIZATION, DIFFERENTIAL CROSS SECTIONS, QUANTUM THEORY, THEORY, REPRINTS, CROSS SECTIONS, FORMULAS(MATHEMATICS), EXCITATION, TRANSFER, LASERS, QUANTUM THEORY, TRANSFER, MOLECULE MOLECULE INTERACTIONS, ATOMIC ENERGY LEVELS

IDENTIFIERS: (U) \*Rydberg atoms, \*Excitation transfer, Associative ionization, Quantal theory, Molecular collisions, PE81102F, WJAFOSR230383

AD-A162 986

UNCLASSIFIED

PAGE 11 EVK55.

AD-A162 985

7/4

COLORADO UNIV AT BOULDER DEPT OF CHEMISTRY

(U) Product Vibrational State Distributions of Thermal Energy Charge Transfer Reactions Determined by Laser-Induced Fluorescence in a Flowing Afterglow: Ar(+) + CO Yields CO(+)(V=0-6) + Ar.

SEP 85 11P

PERSONAL AUTHORS: Hamilton, Charles E.; Bierbaum, Veronica M.; Leone, Stephen R.;

CONTRACT NO. F49620-83-C-0013

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-85-1151

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v83  
n5 p2284-2292, 1 Sep 85.

ABSTRACT: (U) Ar(+) + CO yields CO(+) (v=0-6) + Ar charge transfer reaction is studied at thermal energy in a flowing afterglow and the vibrational state distribution is determined by laser-induced fluorescence on the CO(+) (A 2P; - X 2 Sigma(+)) bands. The nascent vibrational state distribution is (0.06 + or - 0.04) at v = 0; (0.07 + or - 0.02) v = 1; (0.09 + or - 0.02) at v = 2 (0.15 + or - 0.03) at v = 3; (0.21 + or - 0.02) at v = 4; (0.27 + or - 0.02) at v = 5 (0.09 + or - 0.02) at v = 6. The rate constant for Co+ (v = 4) deactivation by CO is measured to be 6.0 + or - 2.5 x 10 to the -10th power cu cm/sec; the similarity of this rate constant to that for CO+ (v = 1) deactivation by a charge transfer mechanism. The Ar(+) + CO reaction is described as proceeding via a bent ArCO+ intermediate that forms in a side-on attack. Vibrational excitation may then result from delocalization of the bonding electron density of CO and the corresponding dynamical changes in the CO bond length in the intermediate. Keywords: Argon; Carbon monoxide; Ion-molecule reaction dynamics; Laser; Vibration; Reprints.

AD-A162 985

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 985 CONTINUED

AD-A162 984 20/3

DESCRIPTORS: (U) \*CHARGE TRANSFER, \*REACTION KINETICS, ARGON, CARBON MONOXIDE, RESPONSE, DYNAMICS, IONS, LASER INDUCED FLUORESCENCE, CONSTANTS, RATES, BONDING, ELECTRON DENSITY, CHARGE TRANSFER, DEACTIVATION, DISTRIBUTION, VIBRATION, REPRINTS, IONS, MOLECULAR VIBRATION, ENERGY LEVELS, CHEMICAL BONDS, SIDE REACTIONS, THERMAL RADIATION, EXCITATION, LASERS

COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY

(U) Magnetic Field Effect on the Intersystem Crossing Rate Constants of Biradicals Measured by Nanosecond Transient UV Absorption.

DESCRIPTIVE NOTE: Rept. for 1984-1985.

IDENTIFIERS: (U) Flowing afterglow, Ion molecule reactions, PE61102F, WUAFOSR2303B1

85 3P

PERSONAL AUTHORS: Zimmt, Matthew B. ; Doubleday, Charles, Jr. ; Turro, Nicholas J. ;

CONTRACT NO. AFOSR-84-0040

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-85-1193

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the American Chemical Society, v107 p6728-6727 1985.

ABSTRACT: (U) We report the first observation of a magnetic field effect on the total intersystem crossing rate constants of biradicals. This allows a simple measurement of the separate contributions of spin-orbit coupling (SOC) and electron-nuclear hyperfine coupling (HFC) to the intersystem rate constant. Our quantitative results affirm the conclusion of the accompanying paper that SOC is the dominant ISC mechanism in biradicals with an acyl terminus. The results suggest a revision of the accepted interpretation of biradical CIDNP. (Author)

DESCRIPTORS: (U) \*MAGNETIC FIELDS, ABSORPTION, CONSTANTS, COUPLING(INTERACTION), CROSSINGS, MEASUREMENT, OBSERVATION, ORBITS, RATES, SPINNING(MOTION), TRANSIENTS, ULTRAVIOLET RADIATION, REPRINTS

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2

AD-A162 985

AD-A162 984

UNCLASSIFIED

PAGE 12

EVK551

UNCLASSIFIED

AD-A162 983 17/9 20/14 4/2 DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551  
AD-A162 983 CONTINUED

CONTROL DATA CORP MINNEAPOLIS MN METEOROLOGY RESEARCH  
CENTER

(U) The Interaction and Variation of Waves and Turbulence  
from MST Radar Data.

DESCRIPTIVE NOTE: Final rept. 1 Feb 82-30 Sep 85.

NOV 85 11P

PERSONAL AUTHORS: Nastrom, G. D. ;

CONTRACT NO. F49620-82-C-0028

PROJECT NO. 2310

TASK NO. A1

MONITOR: AFOSR  
TR-85-1138

UNCLASSIFIED REPORT

ABSTRACT: (U) This report summarizes research results obtained using data from clear-air Doppler radars in Alaska, Colorado, and France. Among other variables, these radars measure the vertical velocity over the height range from about three to twenty kilometers. A brief climatology of the variability of vertical velocity was prepared, including a study of its relationship to synoptic weather events. Comparisons of the time-averaged vertical velocity to estimates of the vertical velocity computed from the equations of motion and routine meteorological data showed that these radars provide a measure of the sub-synoptic scale vertical velocity of the atmosphere, at least under certain conditions. Details of the echoing mechanism for vertically directed antenna systems were studied to help interpret the measurements. Another variable provided by MST radars is the backscattered echo power, which is directly related to the refractivity turbulence structure constant (C-sub-n-squared) when the antenna beam is not directed vertically. Keywords include: MST Radar, Clear-air Radar, Synoptic-scale, Vertical Velocity, Refractivity Turbulence, Wave Effects, Diurnal, Annual, and Climatology.

DESCRIPTORS: (U) \*CLEAR AIR TURBULENCE, \*DOPPLER RADAR,

AD-A162 983

AD-A162 983

UNCLASSIFIED

PAGE 13

EVK551

\*ANTENNA RADIATION PATTERNS, CLIMATOLOGY, EQUATIONS OF MOTION, HEIGHT, REFRACTION, TURBULENCE, COLORADO, FRANCE, CONSTANTS, STRUCTURAL PROPERTIES, VELOCITY, VERTICAL ORIENTATION, MEAN, TIME, VARIATIONS, WAVES

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A182 981

20/5

AD-A182 981 CONTINUED

ILLINOIS INST OF TECH CHICAGO DEPT OF CHEMISTRY

(U) Laser Induced Fluorescence Study of the HeBr<sub>2</sub> Van Der Waals Complex.

DEC 84

9P

PERSONAL AUTHORS: Burgt, Lambertus J. Van de ; Nicolai, Jean-Philippe ; Heaven, Michael C. ;

CONTRACT NO. AFOSR-83-0173, NSF-CHE83-08272

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-85-1168

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v81  
n12 pt1, 15 Dec 84.

ABSTRACT: (U) The HeBr<sub>2</sub> van der Waals complex has been observed in a free jet expansion. The complex was detected by laser excitation of the b bands associated with the Br<sub>2</sub>(B - X) system. High resolution (0.05/cm) spectra have been recorded for the 11-0 to 38-0 bands. The rotational structure has been resolved for several bands and the analysis is found to be consistent with a rigid T-shaped geometry. The distance from the Br<sub>2</sub> bond center to the He atom is 3.8 Å and 3.7 Å for the excited and ground states, respectively. Vibrational predissociation of the He-Br<sub>2</sub> bond has been observed via homogeneous broadening of the rotational lines. Predissociation rates, derived from the line shape data, showed a strong dependence on the Br<sub>2</sub> vibrational excitation. Rates varied from 10 to the 10th power/s for  $\nu' = 11$ , up to  $10^{10}$  to the 11th power/for  $\nu' = 38$ . The data can be adequately described by a simple energy gap model for the predissociation probability. Keywords: Halogen; van der Waals complex; Vibrations; predissociation; Laser induced fluorescence spectroscopy; Reprints.

DESCRIPTORS: (U) \*LASERS, \*LASER INDUCED FLUORESCENCE, ATOMS, DATA PROCESSING, ENERGY GAPS, EXCITATION, GROUND

AD-A182 981

AD-A182 981

UNCLASSIFIED

PAGE 14

EVK551

STATE, HIGH RESOLUTION, LASER INDUCED FLUORESCENCE, LINE SPECTRA, LINEAR SYSTEMS, MODELS, REPRINTS, ROTATION, SHAPE, SPECTROSCOPY, STRUCTURAL PROPERTIES

IDENTIFIERS: (U) PE61102F, WUAFOSR230382



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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 980 7/4

AD-A162 980 CONTINUED

COLORADO UNIV AT BOULDER DEPT OF CHEMISTRY

(U) Flowing Afterglow Infrared Chemiluminescence Studies of Vibrational Energy Disposal in the Ion-Molecule Reactions  $F^- + HBr.DBr$  Yields  $HF.DF + Br^-$ .

OCT 85 8P

DESCRIPTORS: (U) \*REACTION KINETICS, DEUTERON REACTIONS, IONS, MOLECULES, SURFACES, VIBRATION, PROTONS, TRANSFER, COLLISIONS, NEUTRAL, DISTRIBUTION, DISPOSAL, ENERGY, AFTERGLOWS, MOLECULAR VIBRATION, ENERGY LEVELS, INFRARED PHENOMENA, FLUORIDES, BROMIDES, HYDROGEN COMPOUNDS, DEUTERIUM COMPOUNDS, REPRINTS

IDENTIFIERS: (U) Flowing afterglow, Hydrogen fluoride, Ion molecule reactions, PE61102F, WUAF05R2303B1

PERSONAL AUTHORS: Langford, Andrew G. ; Rierbaum, Veronica M. ; Leone, Stephen R. ;

CONTRACT NO. F49620-83-C-0013

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-85-1187

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v83 n8 p3913-3918, 15 Oct 85.

ABSTRACT: (U) Product vibrational state distributions for the ion-molecule reactions  $F(-) + HBr.DBr$  Yields  $HF(v < \text{or} = 4)$ ,  $DF(v < \text{or} = 6) + Br(-)$  are determined using the flowing afterglow infrared chemiluminescence technique. The nascent distributions are  $(0.09 + \text{or} - 0.04)v=1$ ;  $(0.29 + \text{or} - 0.04)v=2$ ;  $(0.34 + \text{or} - 0.04)v=3$ ;  $(0.28 + \text{or} - 0.04)v=4$  for the  $HF$  product, and  $(0.05 + \text{or} - 0.04)v=1$ ;  $(0.12 + \text{or} - 0.04)v=2$ ;  $(0.16 + \text{or} - 0.04)v=3$ ;  $(0.25 + \text{or} - 0.04)v=4$ ;  $(0.22 + \text{or} - 0.04)v=5$ ;  $(0.20 + \text{or} - 0.04)v=6$  for the  $DF$  product. The fractions of the available energy deposited in product vibration are  $0.60 + \text{or} - 0.04$  and  $0.63 + \text{or} - 0.05$  for the proton transfer and deuteron transfer reactions, respectively. A surprisal analysis suggests that less than 5% of the product molecules are formed in  $v = 0$ . The  $HF$  distribution is somewhat hotter than that reported previously, while the  $DF$  distribution is measured for the first time. Both distributions are remarkably similar to those reported for the analogous neutral processes, which suggests that direct collisions dominate the reactive encounters despite the presence of a deep attractive well in the potential surface for the ion-molecule reactions. (Author)

AD-A162 980

AD-A162 980

UNCLASSIFIED

PAGE 15

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 973 CONTINUED

CONTROL DATA CORP MINNEAPOLIS MN

(U) Direct Measurement of Large-Scale Vertical Velocities  
Using Clear-Air Doppler Radars,

MAY 85 13P

PERSONAL AUTHORS: Nastrom, G. D. ; Ecklund, W. L. ; Gage, K. S.

CONTRACT NO. F49620-82-C-0029

PROJECT NO. 2310

TASK NO. A1

MONITOR: AFOSR  
TR-85-1191

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Monthly Weather Review, v113  
n5 p708-718 May 85.

ABSTRACT: (U) Radars that can make wind measurements in the clear air are expected to play an increasing role in meteorological observing systems in the future, especially for horizontal wind measurements. This paper considers the prospects for using these radars, which are sometimes called wind profilers to also measure the large-scale vertical velocity. Unfortunately, all radars for which vertical velocity data are available at this time are located in or near mountains, where standing lee-wave effects often make the data representative of only small-scale features. Confining attention to those times when lee wave effects are not expected, case-study comparisons of the existing radar data with indirectly computed synoptic-scale motions suggest that time-averaged radar data are representative of large-scale features smaller than the synoptic scale, perhaps more aptly termed subsynoptic-scale features. Results from a three-station radar network in France show that the time-averaged vertical velocities are usually nearly the same at all stations, although there are some differences, and suggest that the spatial scale of the flow features they represent is greater than 50 km. Over a long-term average, the net influence of lee wave effects at mountain sites is small, and radar measurements appear to be useful for

AD-A162 973

AD-A162 973

UNCLASSIFIED

PAGE 10

EVK551

climatological studies of vertical velocity in large-scale circulation systems. Keywords: Velocities; Doppler radars; and Reprints.

DESCRIPTORS: (U) \*DOPPLER RADAR, \*CLEAR AIR TURBULENCE, \*MOUNTAINS, RADAR, AIR, CLIMATE, HORIZONTAL ORIENTATION, MEASUREMENT, WIND, VELOCITY, VERTICAL ORIENTATION, STATIONS, MEASUREMENT, FRANCE, CIRCULATION, SCALE, SPATIAL DISTRIBUTION, MEAN, TIME, PROFILES, SITES, REPRINTS

IDENTIFIERS: (U) \*WJAFOSR2310A1, PE81102F

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 972 7/4 20/8

AD-A162 972 CONTINUED

STANFORD UNIV CA DEPT OF CHEMISTRY

(U) Multiphoton Ionization Photoelectron Spectroscopy of  
Phenol: Vibrational Frequencies and Harmonic Force  
Field for the 2B sub 1 Cation.

JUN 85 13P

\*PHOTOIONIZATION, \*VIBRATIONAL SPECTRA, CATIONS,  
COMPUTATIONS, DYE LASERS, ELECTRONS, EXPANSION, FREQUENCY,  
HARMONICS, IONIZATION, KINETIC ENERGY, LASERS, MOLECULAR  
BEAMS, NEUTRAL, PHOTOELECTRONS, PHOTONS, PULSED LASERS,  
SUPERSONIC CHARACTERISTICS, VIBRATION, EXCITATION, GROUND  
STATE, SPECTROSCOPY, MOLECULAR IONS, REPRINTS

JUN 85 13P

IDENTIFIERS: (U) \*Photoelectron spectroscopy, PE81102F,  
WUAFOSR2303B1

PERSONAL AUTHORS: Anderson, Scott L.; Goodman, Lionel;  
Krogh-Jespersen, Karsten; Ozkabak, Ali G.; Zare, Richard N.;

CONTRACT NO. F49620-83-C-0033

PROJECT NO. 2303

TASK NO. 81

MONITOR: AFOSR  
TR-85-1148

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v82  
n12 p5329-5339, 15 Jun 85.

ABSTRACT: (U) A molecular beam of phenol, cooled by a  
supersonic expansion, is crossed at right angles by the  
output of a pulsed frequency-doubled dye laser, causing 1  
+ 1 resonance enhanced multiphoton ionization. The  
kinetic energy of the resulting photoelectrons is  
determined as a function of laser wavelength with time-of-  
flight analysis, permitting the assignment of 11  
vibrational frequencies for the superscript 2 B sub 1  
phenol-h sub 6 cation and ten vibrational frequencies for  
phenol-d sub 5. Of these, all but the lowest frequency  
one in each case are in-plane vibrations of which phenol  
has a total of 19. An approximate harmonic force field  
for the in-plane modes of the phenol cation is derived  
along with its associated frequencies and mode forms.  
This in turn facilitates the vibrational analysis.  
Analogous force field calculations have been carried out  
on the ground (superscript 1 A sub 1) and first excited  
(superscript 1 B sub 2) states of the neutral parent,  
permitting conclusions to be reached concerning bonding  
changes upon removal of an electron from the phenol  
electron system. (Author)

DESCRIPTORS: (U) \*PHENOLS, \*PHOTOELECTRON SPECTRA,

AD-A162 972

AD-A162 972

UNCLASSIFIED

PAGE 17

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 971 7/5

AD-A162 970 4/2

CORNELL UNIV ITHACA N Y DEPT OF PHYSICS

CONTROL DATA CORP MINNEAPOLIS MN

(U) State-Resolved Photofragmentation of OCS Monomers and Clusters.

(U) Relationship of Precipitation to Vertical Motion Observed Directly by a VHF Wind Profiler during a Spring Upslope Storm Near Denver, Colorado,

85 4P

APR 85 5P

PERSONAL AUTHORS: Sivakumar, N. ; Burak, I. ; Cheung, W. -Y. ; Houston, P. L. ; Hepburn, J. W. ;

PERSONAL AUTHORS: Gage, K. S. ; Nastrom, G. D. ;

CONTRACT NO. AFOSR-83-0279

CONTRACT NO. F49820-82-C-0029

PROJECT NO. 2303

PROJECT NO. 2310

TASK NO. B1

TASK NO. A1

MONITOR: AFOSR  
TR-85-1183

MONITOR: AFOSR  
TR-85-1180

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Physical Chemistry, v89 n17 p3609-3611 1985.

SUPPLEMENTARY NOTE: Pub. in the Bulletin of the American Meteorological Society, v66 n4 p394-397 Apr 85.

ABSTRACT: (U) Dissociation of the OCS monomer at 222 nm yields S(superscript 1 D) and S(superscript 3 P) in the ratio 0.85/0.15 and CO which is >98% in v=0 but with very high rotational energy. The peak in the rotational distribution occurs at J=55 and corresponds to about 56% of the available energy for the S(superscript 1 D) channel. These results support the contention that the upper OCS superscript 1 Delta state is bent. Dissociation of OCS clusters leads to a completely photochemistry: at least some of the CO is formed rotationally cold (T sub rot approx. 50 K), and S sub 2 is also produced. (Author)

ABSTRACT: (U) A comparison is presented between vertical motion observed directly by a VHF wind profiler and the rainfall rate measured at two surface stations during an intense Colorado upslope spring storm. Averaged (8-9 hrs) precipitation rate and sub-synoptic scale vertical motion are well-correlated. Fluctuations of shorter duration present in the rainfall rate as well as in the vertical motion are also well-correlated. (Reprints)

DESCRIPTORS: (U) \*MONOMERS, \*PHOTODISSOCIATION, DISSOCIATION, DISTRIBUTION, HIGH ENERGY, PHOTOCHEMICAL REACTIONS, ROTATION, CLUSTERING, MOLECULAR STRUCTURE, CARBON MONOXIDE, MOLECULAR ENERGY LEVELS, MOLECULAR VIBRATION, REPRINTS

DESCRIPTORS: (U) \*PRECIPITATION, \*RAINFALL INTENSITY, \*STORMS, \*PROFILES, \*WIND, COLORADO, RATES, SPRINGS, STATIONS, SURFACES, VERY HIGH FREQUENCY, INTENSITY, MOTION, VERTICAL ORIENTATION, REPRINTS

IDENTIFIERS: (U) Van der Waals Forces, MUAFOSR2303B1, PE61102F

IDENTIFIERS: (U) PE61102F, MUAFOSR2310A1

AD-A162 971

AD-A162 970

UNCLASSIFIED

PAGE 18 EVK551

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTINUED NO. EVK551

AD-A162 957

12/1

AD-A162 954

9/2

NORTH CAROLINA UNIV AT CHAPEL HILL CENTER FOR STOCHASTIC PROCESSES

MARYLAND UNIV COLLEGE PARK CENTER FOR AUTOMATION RESEARCH

(U) A Martingale Characterization of Mixed Poisson Processes.

(U) Updating Properties of Directed Acyclic Graphs on a Parallel Random Access Machine.

DESCRIPTIVE NOTE: Technical rept. 1 Sep 85-31 Aug 86.

DESCRIPTIVE NOTE: Technical rept.,

OCT 85

11P

SEP 85

24P

PERSONAL AUTHORS: Pfeifer, Dietmar ;

PERSONAL AUTHORS: Pawagi, Shaunak ; Ramakrishnan, I. V. ;

REPORT NO. TR-119

REPORT NO. CAR-TR-148, CS-TR-1551

CONTRACT NO. F49620-85-C-0144

CONTRACT NO. F49620-83-C-0082, N00014-84-K-0530

PROJECT NO. 2304

PROJECT NO. 2304

TASK NO. A5

TASK NO. A7

MONITOR: AFOSR  
TR-85-1177

MONITOR: AFOSR  
TR-85-1124

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) It is shown that an elementary pure birth process is a mixed Poisson process if the sequence of post-jump intensities forms a martingale with respect to the delta-fields generated by the jump times of the process. In this case, the post-jump intensities converge a.s. to the mixing random variable of the process.  
Keyword: Applied probability. (Author)

SUPPLEMENTARY NOTE: Sponsored in part by Grant NSF-ECS84-04399.

ABSTRACT: (U) Fast parallel algorithms are presented for updating the transitive closure, the dominator tree, and a topological ordering of a directed acyclic graph (DAG) when an incremental change has been made to it. The kinds of changes that are considered here include insertion of a vertex or insertion and deletion of an edge. The machine model used is a parallel random access machine which allows simultaneous reads but prohibits simultaneous writes into the same memory location. The algorithms described in this paper require  $O(\log n)$  time and use  $O(n)$  processors. These algorithms are efficient when compared to previously known  $O(\log^2 n)$  time algorithms for initial computation of the above mentioned properties of DAGs. The authors describe a new algorithm for initial computation of the dominator tree of a DAG. Their algorithm improves the processor complexity of a previously known algorithm by a factor of  $n$ , but does not affect the time complexity, which remains  $O(\log^2 n)$ . (Author)

DESCRIPTORS: (U) \*POISSON DENSITY FUNCTIONS, PROBABILITY, MIXING, POISSON EQUATION, BIRTH, PURITY, RANDOM VARIABLES, CONVERGENCE

IDENTIFIERS: (U) Martingales, PE81102F, WUAFOSR2304A5

AD-A162 957

AD-A162 954

## UNCLASSIFIED

PAGE 19 EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 954 CONTINUED

AD-A162 952 11/10 20/11 7/3

DESCRIPTORS: (U) \*RANDOM ACCESS COMPUTER STORAGE,  
\*ALGORITHMS, COMPUTATIONS, GRAPHS, PARALLEL PROCESSING,  
TIME, POSITION(LOCATION), PROCESSING EQUIPMENT, TIME

STANFORD UNIV CA DEPT OF CHEMISTRY

(U) Molecular Theory of Rubber Elasticity.

IDENTIFIERS: (U) PE61102F, WUAFQSR2304A7

85 15P

PERSONAL AUTHORS: Flory, Paul J. ;

CONTRACT NO. AFOSR-82-0009

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-85-1161

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Polymer Jnl., v17 n1 p1-12  
1985.

ABSTRACT: (U) Rubber elasticity, identified as the capacity to sustain very large deformations followed by complete recovery, is exhibited exclusively by polymeric substances consisting predominantly of long molecular chains. Moreover, it is manifested under suitable conditions by virtually all polymers so constituted. The molecular theory of rubber elasticity rests on the premise, now fully validated by experiments, that alterations of the configurations of the chains comprising the network account for the elastic free energy and for the stress arising from the deformation. Early theories of rubber elasticity were propounded on the assumption that displacements of the junctions are affine in the macroscopic strain. James and Guth, avoiding this assumption, treated a phantom network consisting of Gaussian chains having otherwise no material properties. They showed (i) that the mean positions of the junctions in this hypothetical network are affine in the strain, and (ii) that fluctuations about these positions are invariant under strain. The corollary that the instantaneous distribution of the chain vectors cannot be affine in the strain escaped notice for many years. The copious interpenetration of chains that characterizes polymer networks should be expected to restrain the fluctuations of junctions embedded therein, but not to suppress them altogether.

AD-A162 954

AD-A162 952

UNCLASSIFIED

PAGE 20

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 952 CONTINUED

AD-A162 951 7/3

Moreover, the restraints on fluctuations should depend on the state of strain. Departures from phantom behavior consequently occur to a degree that depends on the strain.

DESCRIPTORS: (U) \*MOLECULAR STRUCTURE, \*ELASTIC PROPERTIES, \*RUBBER, POLYMERS, DEFORMATION, THEORY, DISTRIBUTION, POLYMERS, CONFIGURATIONS, DISPLACEMENT, JUNCTIONS, ELASTIC PROPERTIES, FREE ENERGY, CHAINS, MOLECULES, NETWORKS, POLYMERS, REPRINTS, STRAIN(MECHANICS), DEFORMATION

IDENTIFIERS: (U) WUAFOSR2303A3, PE81102F

UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES DEPT OF CHEMISTRY

(U) Titanium Tetrachloride Promoted Reactions of Allylic Trimethylsilanes and Oxetane,

85 5P

PERSONAL AUTHORS: Carr, Steve A. ; Weber, William P. ;

CONTRACT NO. AFOSR-82-0333

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-85-1160

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Organic Chemistry, v50 n15 p2782-2785 1985.

ABSTRACT: (U) Many reactions of allylic trimethylsilanes involved electrophilic substitution with allylic rearrangement and loss of the trimethylsilyl group. These reactions may occur addition of the electrophile to the carbon-carbon double bond to yield a carbocation intermediate which is stabilized by a Beta-trimethylsilyl group. Nucleophilic attack on silicon by an associated anion or solvent results in loss of the silyl group and formation of products. (Author)

DESCRIPTORS: (U) \*CHEMICAL REACTIONS, \*SILANES, \*OXETANES, CATALYSIS, METHYL RADICALS, SUBSTITUTION REACTIONS, NUCLEOPHILIC REACTIONS, SILICON, CHLORIDES, TITANIUM COMPOUNDS, REPRINTS

IDENTIFIERS: (U) Allyl radicals, Electrophilic reactions, PE81102F, WUAFOSR2303B2

AD-A162 952

AD-A162 951

UNCLASSIFIED

PAGE 21

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 950 CONTINUED

AD-A162 950 7/4

PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF CHEMISTRY

(U) Reduction of Nitric Oxide on the Carbon Pretreated Rh(331) Single Crystal Surface. Evidence for Molecular Cn - Formation,

85 12P

PERSONAL AUTHORS: DeLouise, L. A. ; Winograd, N. ;

CONTRACT NO. AFOSR-85-0028

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR  
TR-85-1157

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Surface Science, v154 p79-89 1985.

ABSTRACT: (U) The chemisorption of NO on the carbon pretreated Rh(331) single crystal surface has been investigated by XPS, LEED and SIMS. The carbon overlayer was prepared by dehydrogenation of chemisorbed C<sub>2</sub>H<sub>4</sub>. Results of NO absorption at room temperature show that surface carbon blocks adsorption sites that normally coordinate molecular NO sub Ads and is dissociated products, N sub Ads and O sub Ads, as determined by comparing to experiments performed on clean Rh(331). Heating the surface which contains NO sub Ads, N sub Ads, O sub Ads and C sub Ads, induces a series of chemical reactions starting with the dissociation of molecular NO sub Ads. Above 400 K, the C sub Ads and N sub Ads atoms combine to form CN(-). The formation of the latter species is confirmed by the temperature evolution of the Rh<sub>2</sub>CN(+) and CN(-) SIMS ion yields. The C sub Ads species also reacts with O sub Ads to produce CO and/or CO<sub>2</sub>. These processes occur preferentially over the desorption of N<sub>2</sub> and O<sub>2</sub>. In general, it is demonstrated that by using the XPS and SIMS methods, it is possible to identify the reaction species present on the surface at any given temperature and to unravel rather complex reaction pathways.

AD-A162 950

AD-A162 950

UNCLASSIFIED

PAGE 22

EVK551

DESCRIPTORS: (U) \*REDUCTION(CHEMISTRY), \*SURFACE CHEMISTRY, \*MOLECULAR IONS, \*NITROGEN OXIDES, NITROGEN, OXYGEN, CHEMICAL DISSOCIATION, ABSORPTION, ROOM TEMPERATURE, CARBON, CHEMISORPTION, DEHYDROGENATION, ATOMS, RESPONSE, CHEMICAL REACTIONS, IONS, YIELD, DESORPTION, TEMPERATURE, REPRINTS

IDENTIFIERS: (U) PE81102F, WUAFOSR2303A2



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 948 7/4 20/8

AD-A162 943 20/6

COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY

MASSACHUSETTS INST OF TECH CAMBRIDGE RESEARCH LAB OF ELECTRONICS

(U) Nanosecond Flash Photolysis Studies of Intersystem Crossing Rate Constants in Biradicals: Structural Effects Brought about by Spin Orbit Coupling.

85 3P

DESCRIPTIVE NOTE: Final rept. 1 Jan 82-31 Oct 84,

PERSONAL AUTHORS: Zimmt, Matthew B.; Doubleday, Charles E., Jr.; Gould, Ian R.; Turro, Nicholas J.;

DEC 83 4P

PERSONAL AUTHORS: Meyer, R. E.; Ezekiel, S.; Stowe, D. W.; Tekippe, V. J.;

CONTRACT NO. AFOSR-84-0040

PROJECT NO. 2303

CONTRACT NO. F49620-82-C-0091

TASK NO. 82

PROJECT NO. 2305

MONITOR: AFOSR TR-85-1192

TASK NO. B2

MONITOR: AFOSR TR-85-1204

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the American Chemical Society, v107 p6724-6725, 1985.

SUPPLEMENTARY NOTE: Pub. in Optics Letters, v8 n12 p644-646 Dec 83.

ABSTRACT: (U) This paper concerns the structural effects of spin-orbit coupling (SOC) as a mechanism of intersystem crossing (isc) in triplet-derived biradicals. First we show that SOC is strongly enhanced in biradicals with an acyl terminus relative to biradicals with only hydrocarbon termini. Second, we present evidence that, even for long chains, biradicals containing an acyl terminus prefer to undergo isc in conformers with small end-to-end distances. This appears to be a direct result of the dominance of SOC over electron-nuclear hyperfine coupling (HFC) in the isc process.

ABSTRACT: (U) Passive ring resonator rotation sensors have been constructed and their bias and noise performance studied. Most effort was devoted to implementing a fiber-optic ring resonator with a possibility of achieving high Q. A noise equivalent sensitivity of 0.5 degrees per hour was achieved, which is one order higher than the shot noise limit. Error sources have been studied. (Reprints)

DESCRIPTORS: (U) \*COUPLING(INTERACTION), \*PHOTOLYSIS, \*ORGANIC RADICALS, \*REACTION KINETICS, CONSTANTS, FLASHES, HYDROCARBONS, MOLECULAR ORBITALS, SPIN STATES, ACYLATION, CROSSLINKING(CHEMISTRY), MOLECULAR STRUCTURE, REPRINTS

DESCRIPTORS: (U) \*PASSIVE SYSTEMS, \*FIBER OPTICS, \*RESONATORS, ERRORS, SOURCES, NOISE, PERFORMANCE(ENGINEERING), RINGS, DETECTION, ROTATION, LIMITATIONS, SHOT NOISE, PASSIVE SYSTEMS, REPRINTS, DETECTORS

IDENTIFIERS: (U) PE61102F, WUAFOSR230382

IDENTIFIERS: (U) WUAFOSR2305B2, PE61102F

AD-A162 948

AD-A162 943

UNCLASSIFIED

PAGE 23 EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 930

4/1

UTAH STATE UNIV LOGAN

(U) Ground-Based Atmospheric Infrared and Visible Emission Measurements.

DESCRIPTIVE NOTE: Rept. for 15 Jul 83-14 Jun 85,

85

15P

PERSONAL AUTHORS: Baker, D. J. ; Steed, A. J. ; Ware, G. A. ;  
Offermann, D. ; Lange, G. ;

CONTRACT NO. F49620-83-C-0122

PROJECT NO. 2310

TASK NO. A2

MONITOR: AFOSR  
TR-85-1181

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Atmospheric and  
Terrestrial Physics, v47 n1-3 p133-145 1985.

ABSTRACT: (U) This reprint describes ground-based measurements of night-sky near-infrared and visible emissions made at the Andenes, Norway, and Kiruna, Sweden, rocket launch sites during the Energy Budget Campaign of 1980. Optical measurements were made using visible and infrared photometers, a Michelson interferometer and a grating spectrometer. The specific aim of the experiments reported in the present paper was to investigate the relationships between the optical emissions from upper atmospheric hydroxyl (OH) and molecular oxygen (O<sub>2</sub>) and the magnetic activity in the auroral zone. Other airglow emissions, including the O and N<sub>2</sub>(+) species, were monitored photometrically for diagnostic purposes. Furthermore, the ground-based optical instruments were used to support rocket-borne experiments launched in salves during the campaign. Observations were provided before and after the launches of the rocket payloads. Comparisons between upper atmospheric temperatures derived from airglow emissions and those obtained from in situ rocket probes were sought.

DESCRIPTORS: (U) \*AIRGLOW, \*UPPER ATMOSPHERE, AURORAE,

AD-A162 930

AD-A162 930

UNCLASSIFIED

PAGE 24

EVK551

BUDGETS, EMISSION, ENERGY CONSERVATION, GRATINGS(SPECTRA), GROUND LEVEL, INFRARED RADIATION, LAUNCHING SITES, MAGNETIC FIELDS, MEASUREMENT, MICHELSON INTERFEROMETERS, MOLECULAR PROPERTIES, NORWAY, OPTICAL INSTRUMENTS, OPTICAL PROPERTIES, OXYGEN, PAYLOAD, PHOTOMETERS, ROCKET LAUNCHING, ROCKETS, SOUNDING ROCKETS, SPECTROMETERS, SWEDEN, VISIBLE SPECTRA, INFRARED SPECTRA, PHOTOMETRY, NIGHT SKY, NEAR INFRARED RADIATION, HYDROXYL RADICALS, NITROGEN, IONS, REPRINTS

IDENTIFIERS: (U) Energy Budget Campaign, PE81102F,  
WUAFOSR2310A2

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DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 929 12/1

AD-A162 928 7/4 7/5

PRINCETON UNIV NJ DEPT OF CHEMISTRY

COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY

(U) Scaling of Nonlocal Operators,

(U) Carbene and Silicon Routes Toward a Simple Nitrile Ylide. Spectroscopic, Kinetic, and Chemical Characterization,

AUG 85 7P

PERSONAL AUTHORS: Lee, Duckhwan ; Rabitz, Herschel ;

85 3P

CONTRACT NO. AFOSR-84-0106

PERSONAL AUTHORS: Turro, Nicholas J. ; Cha, Yuan ; Gould, Ian R. ; Padwa, Albert ; Gasdaska, John R. ;

PROJECT NO. 2303

CONTRACT NO. AFOSR-84-0040

TASK NO. B1

PROJECT NO. 2303

MONITOR: AFOSR

TASK NO. B1

TR-85-1185

UNCLASSIFIED REPORT

MONITOR: AFOSR  
TR-85-1186

SUPPLEMENTARY NOTE Pub. in Physical Review A, v32 n2  
p877-882 Aug 85.

UNCLASSIFIED REPORT

ABSTRACT: (U) An exact scaling relation developed for nonlocal operators is presented in this reprint. The matrix elements of a general nonlocal operator are related to a set of reduced matrix elements through scaling coefficients which do not explicitly depend on the particular nonlocal operator. The theory reduces to a conventional local scaling formulation in that limit. The guide to developing the nonlocal scaling relation comes from consideration of general symmetry properties of the nonlocal operator in a chosen representation. Operators with high degrees of symmetry will generally lead to scaling relations requiring a small number of scaling coefficients for practical applications. The theory is expected to be useful not only for providing exact nonlocal scaling relations but also as a tool for developing approximate scaling relations which still retain the nonlocal nature of the operator to an appropriate extent. Keywords: Harmonic oscillator functions. (Author)

DESCRIPTORS: (U) \*SCALING FACTORS, \*SYMMETRY, \*FUNCTIONS, OPERATORS(PERSONNEL), COEFFICIENTS, HARMONIC GENERATORS

IDENTIFIERS: (U) WUAFOSR2303B1, PE81102F

AD-A162 929

AD-A162 928

UNCLASSIFIED

PAGE 25

EVK551

SUPPLEMENTARY NOTE: Pub. in Jnl. of Organic Chemistry, v50 p4417-4418 1985.

ABSTRACT: (U) The generation and characterization of methyl nitrile ylide photochemically by addition of singlet methylene to acetonitrile and chemically from a silylthioimide and subsequent dipolar cycloaddition are carried out.

DESCRIPTORS: (U) \*METHYL RADICALS, \*NITRILES, \*ANALYTICAL CHEMISTRY, \*PHOTOCHEMICAL REACTIONS, CYCLIC COMPOUNDS, DIPOLES, ACETONITRILE, METHYLENES, ADDITION REACTIONS, SILICON, CARBENES, MOLECULAR STRUCTURE, SPECTROSCOPY, REACTION KINETICS, LASER APPLICATIONS, SPECTROSCOPY, REPRINTS

IDENTIFIERS: (U) \*Ylides, WUAFOSR2303B1, PE81102F

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

## SEARCH CONTROL NO. EVK551

AD-A162 923

7/3

## WISCONSIN UNIV-MADISON DEPT OF CHEMISTRY

(U) Organogermene Homopolymers and Copolymers with Organosilanes,

85 10P

PERSONAL AUTHORS: Trefonas, P. ; West, R. ;

CONTRACT NO. AFOSR-82-0087

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-85-1152

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Polymer Science, Polymer Chemistry Edition, v23 p2099-2107 1985.

ABSTRACT: (U) The first high molecular weight soluble, formable organogermene homopolymer( $\text{nBu}_2\text{Ge}$ ) $_n$  was synthesized by the sodium coupling of  $\text{n-Bu}_2\text{GeCl}_2$  in toluene. Soluble organogermene/organosilane copolymers( $(\text{X}_2\text{Ge})_x(\text{YZSi})_y$ ) $_n$  were prepared by sodium coupling of  $\text{X}_2\text{GeCl}_2$  and  $\text{YZSiCl}_2$  in different molar ratios ( $\text{X}=\text{n-Bu}$ ,  $\text{Ph}$ ;  $\text{Y}=\text{n-hexyl}$ ,  $\text{cyclohexyl}$ ;  $\text{Z}=\text{Me}$ ). Germanium-containing polymers and copolymers with organosilanes are highly absorbing between 300-360 nm, with the absorption maxima dependent on the nature of the substituent and the ratio of  $\text{X}_2\text{Ge}:\text{YZSi}$  in the polymer. These polymers are photoactive and display bleaching behavior with photocission.

DESCRIPTORS: (U) \*POLYMERS, \*ORGANOMETALLIC COMPOUNDS, \*GERMANIUM COMPOUNDS, ABSORPTION, MOLECULAR WEIGHT, ORGANIC COMPOUNDS, SILANES, COUPLING(INTERACTION), SODIUM, COPOLYMERS, TOLUENES, SYNTHESIS(CHEMISTRY), REPRINTS

IDENTIFIERS: (U) PE81102F, WUAFOSR2303B2

AD-A162 923

## UNCLASSIFIED

AD-A162 922

PAGE 28

EVK551

AD-A162 922

7/3

## NORTH DAKOTA STATE UNIV FARGO DEPT OF CHEMISTRY

(U) The Intrinsic Reaction Coordinate and the Rotational Barrier in Silaethylene,

85 6P

PERSONAL AUTHORS: Schmidt, Michael W. ; Gordon, Mark S. ; Dupuis, Michel ;

CONTRACT NO. AFOSR-82-0190

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-85-1145

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of American Chemical Society, v107 n9 p2585-2589 1985.

ABSTRACT: (U) The intrinsic reaction coordinate (IRC) is a minimum-energy pathway connecting reactants to products via the transition state. An improved algorithm for the determination of an IRC is presented. The method is illustrated for the rotation of the silicon-carbon double bond in silaethylene. This IRC shows all coordinates vary smoothly during the rotation from the planar to twisted structures, except for a slight pyramidalization at carbon. The rotational barrier is found to be about 37 kcal/mol, in good agreement with experimental estimates.

DESCRIPTORS: (U) \*ETHYLENE, \*SILICON COMPOUNDS, \*MOLECULAR STRUCTURE, CHEMICAL BONDS, ENERGY, ALGORITHMS, CARBON, BARRIERS, ROTATION, TRANSITIONS, COORDINATES, REACTANTS(CHEMISTRY), SILICON, REPRINTS

IDENTIFIERS: (U) IRC(Intrinsic Reaction Coordinate), PE81102F, WUAFOSR2303B2

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

## SEARCH CONTROL NO. EVK551

AD-A162 921 12/1

AD-A162 919 7/4 7/3

VALE UNIV NEW HAVEN CT DEPT OF ELECTRICAL ENGINEERING

WISCONSIN UNIV-MADISON DEPT OF CHEMISTRY

(U) Adaptive Stabilization of Linear Systems with Unknown High-Frequency Gains.

(U) ESR (Electron Spin Resonance) Spectra for Anion Radicals of Alkylcyclooctasilanes and Cyclopentasilanes.

JUN 85 7P

85 7P

PERSONAL AUTHORS: Mudgett, David R.; Morse, A. S.;

PERSONAL AUTHORS: Wadsworth, Cynthia L.; West, Robert; Nagai, Yoichiro; Watanabe, Hamao; Muraoka, Tsutomu;

CONTRACT NO. AFOSR-84-0242

PROJECT NO. 2304

CONTRACT NO. F49620-83-C-0044

TASK NO. A1

PROJECT NO. 2303

MONITOR: AFOSR

TASK NO. B2

TR-85-1107

MONITOR: AFOSR  
TR-85-1199

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in IEEE Transactions on Automatic Control, VAC-30 n8 p549-554 Jun 85.

SUPPLEMENTARY NOTE: Pub. in Organometallics, v4 n9 p1659-1684 1985.

ABSTRACT: (U) This reprint presents an algorithm for adaptively controlling a single-input, single-output process admitting an n-dimensional, minimum-phase linear model of relative degree n\*, with unknown parameters. A priori knowledge of the sign of the model's high frequency gain is not required, and a sufficiently rich probing signal is not needed for stabilization. Keywords: Adaptive control systems; Closed loop systems. (Author)

ABSTRACT: (U) ESR spectra are reported for anion radicals formed by reduction of the cyclosilanes (Me<sub>2</sub>Si)<sub>4</sub>, (Et<sub>2</sub>Si)<sub>4</sub>, (Et<sub>2</sub>Si)<sub>5</sub>, ((CH<sub>2</sub>)<sub>4</sub>Si)<sub>4</sub>, ((CH<sub>2</sub>)<sub>5</sub>Si)<sub>5</sub>, (i-Pr<sub>2</sub>Si)<sub>4</sub>, (i-Bu<sub>2</sub>Si)<sub>4</sub>, two isomers of (t-BuMeSi)<sub>4</sub>, (n-Pr<sub>2</sub>Si)<sub>5</sub>, (n-Bu<sub>2</sub>Si)<sub>5</sub>, (n-PrMeSi)<sub>5</sub>, and (i-BuMeSi)<sub>5</sub>. All produce anion radicals in which the unpaired electron is delocalized over the cyclosilane ring. Most give single line spectra, but proton hyperfine splittings are resolved for (Me<sub>2</sub>Si)<sub>4</sub>(-), ((CH<sub>2</sub>)<sub>4</sub>Si)<sub>5</sub>(-), and ((CH<sub>2</sub>)<sub>5</sub>Si)<sub>5</sub>(-). Splitting constants for alpha-13C decrease with increasing bulk of the alkyl substituents. For (i-Pr<sub>2</sub>Si)<sub>4</sub>(-) and (s-Bu<sub>2</sub>Si)<sub>4</sub>(-) two equally intense alpha-13C hyperfine splitting constants (hfsc) are observed, consistent with a bent structure for these anion radicals.

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A1

DESCRIPTORS: (U) \*ANIONS, \*CHEMICAL RADICALS, \*SILANES, \*ELECTRON SPIN RESONANCE, REDUCTION(CHEMISTRY), MOLECULAR STRUCTURE, CYCLIC COMPOUNDS, ISOMERS, ALKYL RADICALS, BULK MATERIALS, LINE SPECTRA, ELECTRONS, HYPERFINE STRUCTURE, PROTONS, SPLITTING, REPRINTS

IDENTIFIERS: (U) PE81102F, WUAFOSR2303BL

AD-A162 921

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PAGE 27 EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 917 7/3

AD-A162 917 CONTINUED

UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES DEPT OF  
CHEMISTRY

IDENTIFIERS: (U) Unsaturated compounds, Silanones,  
PE61102F, WUAFOSR2303BL

(U) Unsaturated Reactive Intermediates in Organosilicon  
Chemistry - Recent Results.

MAR 85 10P

PERSONAL AUTHORS: Weber, William P.; Kazoura, Samih A.;  
Mamuel, Georges; Bertrand, Guy;

CONTRACT NO. AFOSR-82-0333

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-85-1172

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Organosilicon and  
Bioorganosilicon Chemistry, ch 8 p99-106 Mar 85.

ABSTRACT: (U) The spectrum of reactive pi-bonded silicon  
intermediates has grown rapidly in the last fifteen years.  
The following doubly bond species have been generated:  
silenes (R2Si double bond CR'2), silanes (R2Si double  
bond O), silamines (R2Si double bond NR'), silathiones  
(R2Si double bond S), disilenes (R2Si double bond SiR2),  
and silaphosphimines (R2Si double bond PR'). Much less  
work has been reported on diagonal pi-bonded silicon  
transients such as 2-silallene (H2C double bond Si  
double bond CH2), silaketene (H2C double bond Si double  
bond O), silacarbodiimide (RN double bond Si double bond  
NR) and silicon dioxide (O double bond Si double bond O).  
Finally, no experiment work has appeared on silicon  
triply bonded transients such as (-C triple bond Si-), (-  
Si triple bond Si-) or (-Si triple bond N). We would like  
to report our efforts to generate silicon dioxide (O  
double bond Si double bond O) and silanitrile (-Si triple  
bond N) intermediates.

DESCRIPTORS: (U) \*ORGANIC COMPOUNDS, \*SILICON COMPOUNDS,  
CHEMICAL BONDS, NITRILES, TRANSIENTS, CHEMISTRY, SILICON  
DIOXIDE, SILICON, BONDED JOINTS, REPRINTS

AD-A162 917

AD-A162 917

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PAGE 28

EVK551

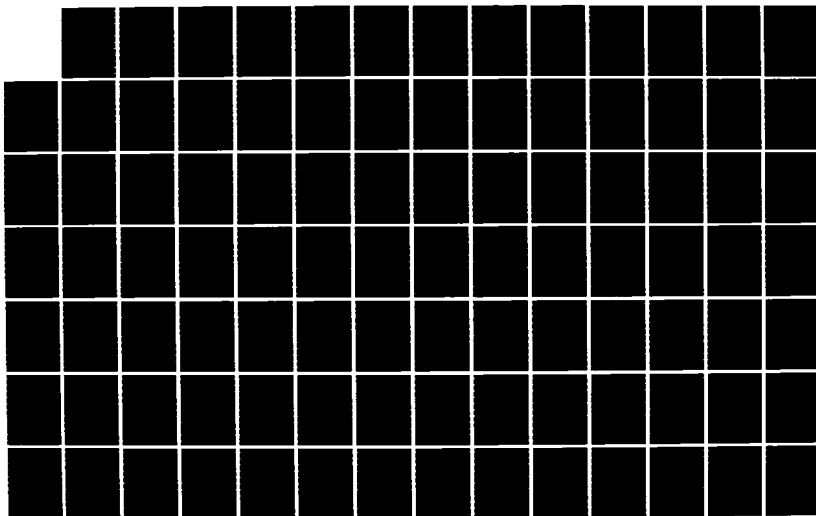
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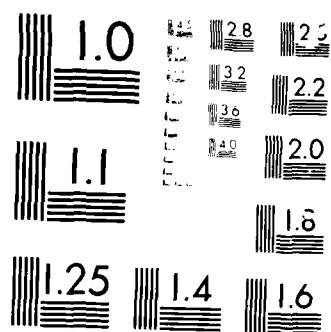
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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 908 7/4 20/10

AD-A162 908 CONTINUED

PRINCETON UNIV NJ DEPT OF CHEMISTRY

(U) Dynamics and Kinetics on Surfaces Exhibiting Defects.

84 14P

\*SURFACE CHEMISTRY, SURFACE REACTIONS, CRYSTAL DEFECTS, ORDER DISORDER TRANSFORMATIONS, CHEMICALS, SURFACES, CHEMICAL PROPERTIES, MATERIALS, KINETICS, ADSORPTION, NONLINEAR SYSTEMS, SITES, DIFFUSION, LENGTH, DYNAMICS, LONG WAVELENGTHS, QUANTUM THEORY, FORMULATIONS, SCATTERING, DYNAMICS, DESORPTION, REPRINTS

PERSONAL AUTHORS: Rabitz, Herschel ;

IDENTIFIERS: (U) PE81102F, WUAFOSR2303B1

CONTRACT NO. AFOSR-84-0108

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-85-1184

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Dynamics on Surfaces, p77-88  
1984.

ABSTRACT: (U) This paper considers dynamics and kinetic phenomena on surfaces with defect structures. Quantum mechanical scattering as well as kinetics and diffusion processes are treated as examples. In the case of quantum mechanics, a theoretical formulation is presented capable of handling atomic disorder on surfaces. The approach is based on an approximation which is best in the quantum long wavelength regime. Some simple illustrations considering scattering off ordered and disordered lattices will be presented. The steady state non-linear reaction-diffusion equations used to describe adsorption, desorption, diffusion and reaction on surfaces with macroscopic scale defects. These defects may arise due to inherent faulting of the lattice or foreign material on the surface. Defects within a mean diffusion length of each other are shown to exhibit cooperativity in their chemical properties. Then reaction-diffusion models are considered. In the case of the non-linear chemical or desorptive aspects of the problem, restricted to the edges of the defect sites. The intervening surface is assumed to be characterized by adsorption, desorption and simple diffusion. These physically realistic models clearly show the capability of multiple steady states existing on active chemical surfaces. (Reprints)

DESCRIPTORS: (U) \*QUANTUM THEORY, \*DEFECTS(MATERIALS),

AD-A162 908

AD-A162 908

UNCLASSIFIED

PAGE

29

EVK551

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A182 907 7/3

AD-A182 908 7/4 7/3

WISCONSIN UNIV-MADISON DEPT OF CHEMISTRY

WISCONSIN UNIV-MADISON DEPT OF CHEMISTRY

(U) Organosilane Polymers: Formable Copolymers Containing Diphenylsilylene Units,

(U) Factors Influencing the Magnitude of Alpha-13C Hyperfine Couplings in Cyclosilane Anion Radicals,

85 8P

85 6P

PERSONAL AUTHORS: Zhang, Xing-Hua ; West, Robert ;

PERSONAL AUTHORS: Wadsworth, Cynthia L. ; West, Robert ;

CONTRACT NO. F49820-83-C-0044

CONTRACT NO. F49820-83-C-0044

PROJECT NO. 2303

PROJECT NO. 2303

TASK NO. B2

TASK NO. B2

MONITOR: AFOSR  
TR-85-1198MONITOR: AFOSR  
TR-85-1198

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Polymer Science: Polymer Letters Edition, v23 p479-485 1985.

SUPPLEMENTARY NOTE: Pub. in Organometallics, v4 n9 p1884-1888 1985.

ABSTRACT: (U) Copolymers of diphenylsilylene with dialkylsilylene units, (Ph<sub>2</sub>Si)n(RR'Si)m, were made by treating a mixture of the corresponding dichlorosilanes with sodium in toluene at 110 C. The resulting polymers were characterized by GPC, 1H and 13C NMR, and infrared spectroscopy. These copolymers have high molecular weights and high proportions of high-molecular-weight fractions as measured by GPC. They are very soluble in common solvents, can be cast into coherent films, and show unique electronic properties. In addition, these copolymers are formed without any insoluble polymer, so purification of the copolymers is simpler than for the systems studied earlier.

ABSTRACT: (U) Considerations of hyperfine coupling constants (hfsc) in the ESR spectra of cyclopolyisilane anion radicals (R<sub>2</sub>Si)n(-) lead to a representation of the singly occupied molecular orbital (SOMO) as a linear combination of Si-C Sigma\* and symmetry-adapted Si-Si sigma\* hybrid orbitals. The atomic orbital contributions to these hybrid orbitals are believed to be principally silicon 3p sub x, 3p sub y and 3p sub z and carbon 2s, 2p sub x 2p sub y and 2p sub z. A simple perturbation approach is used to rationalize the values of 13C hfsc measured for substituted cyclopentasilanes Me<sub>9</sub>Si<sub>5</sub>(-) compared to the value observed for (Me<sub>2</sub>Si) 5(-), in terms of altered mixing of the Si-Si sigma\* and Si-C Sigma orbitals. (Reprints).

DESCRIPTORS: (U) \*SILANES, \*COPOLYMERS, COHERENCE, FILMS, MOLECULAR WEIGHT, ORGANIC COMPOUNDS, POLYMERS, PURIFICATION, SOLVENTS, ELECTRONICS, INFRARED SPECTROSCOPY, SODIUM, PHENYL RADICALS, COPOLYMERIZATION, TOLUENES, GEL PERMEATION CHROMATOGRAPHY, NUCLEAR MAGNETIC RESONANCE, REPRINTS

DESCRIPTORS: (U) \*SILANES, \*MOLECULAR ORBITALS, \*COUPLING(INTERACTION), \*ANIONS, ATOMIC ORBITALS, CYCLIC COMPOUNDS, ELECTRON SPIN RESONANCE, SPECTRA, REPRINTS, MIXING, CONSTANTS, HYPERFINE STRUCTURE, CHEMICAL RADICALS, PERTURBATIONS

IDENTIFIERS: (U) Sillylene/diphenyl, Silene/diphenyl, Sillylene/dialkyl, PE81102F, WUAFOSR230382

IDENTIFIERS: (U) PE81102F, WUAFOSR230382

AD-A182 907

AD-A182 908

UNCLASSIFIED

PAGE 30

EVK551

## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 903 7/5 7/4  
 CORNELL UNIV ITHACA NY

(U) Collisional Deactivation of K(5(2)P(J)) by H(2).  
 Identification of the Primary Quenching Channel).

84 7P

PERSONAL AUTHORS: Lin, King C.; Schilowitz, Alan M.;  
 Wiesenfeld, John R.;

CONTRACT NO. AFOSR-82-0037

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
 TR-85-1159

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Physical Chemistry,  
 v88 n26 p6670-6675 1984.

ABSTRACT: (U) Pulsed photodissociation of KI at 193 nm was used as the source of K(5 superscript 2 P sub J) in a series of experimental studies of collisional deactivation. By comparison of the yield of ground-state K(4 superscript 2 sub J) in the presence and absence of H2 and O2, it was possible to demonstrate that chemical reaction plays no significant role in the deactivation process. Of the available quenching channels, that leading to the intermediate 5 superscript 2 sub J states appears to dominate. The possible importance of near-resonant electronic-to-vibrational energy transfer is discussed and an application to the refinement of alkali metal lasers presented.

DESCRIPTORS: (U) \*PHOTODISSOCIATION, \*POTASSIUM COMPOUNDS, \*IODIDES, METALS, COLLISIONS, DEACTIVATION, CHEMICAL REACTIONS, CHANNELS, QUENCHING, HYDROGEN, GROUND STATE, ENERGY TRANSFER, REPRINTS

IDENTIFIERS: (U) PE81102F, WUAFOSR230381

AD-A162 903

UNCLASSIFIED

PAGE 31 EVK551

AD-A162 898 7/4 20/8

NATIONAL BUREAU OF STANDARDS GAITHERSBURG MD

(U) Time Resolved Measurements of Vibrational Relaxation of Molecules on Surfaces: Hydroxyl Groups on Silica.

JUN 85 3P

PERSONAL AUTHORS: Casassa, M. P.; Hellwell, E. J.;  
 Stephenson, J. C.; Cavanagh, R. R.;

CONTRACT NO. AFOSR-ISSA-85-00004

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR  
 TR-85-1140

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Vacuum Science  
 Technology, VA3 n3 p1855-1858, Jun 85.

ABSTRACT: (U) The vibrational population relaxation rate of the O-H stretching fundamental of hydroxyl groups on SiO2 surfaces was measured directly using picosecond infrared pulses. The vibrational lifetime determined for hydroxyls at the silica-vacuum interface is 204 + or - 20 ps. For silica-bound hydroxyls in a saturated atmosphere of CC14, the lifetime decreases to 159 + or - 18 ps. Both lifetimes are many times longer than would be inferred from infrared absorption linewidths.

DESCRIPTORS: (U) \*MOLECULAR VIBRATION, \*SURFACE CHEMISTRY, \*HYDROXYL RADICALS, \*RELAXATION, DECAY, RELAXATION TIME, ABSORPTION, INFRARED RADIATION, LIFE SPAN(BIOLOGY), VIBRATION, SILICON DIOXIDE, INFRARED PULSES, MOLECULES, POPULATION, RATES, REPRINTS

IDENTIFIERS: (U) PE81102F, WUAFOSR2303A2

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 895 20/10

AD-A162 894 20/12 20/6

UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES DEPT OF CHEMISTRY

UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES DEPT OF CHEMISTRY

(U) <sup>13</sup>C and <sup>1</sup>H Hyperfine Tensors for Polyacetylene Analyzed in Terms of <sup>1</sup> (-o) Electron Coulombic Interactions.

(U) Electrical and Optical Studies of Chemically Synthesized Polypyrrole.

DESCRIPTIVE NOTE: Rept. for 1 Jun 84-1 Jun 85.

DESCRIPTIVE NOTE: Rept. for 1 Jun 84-31 May 85.

85 4P

AUG 85 4P

PERSONAL AUTHORS: Thomann, Hans ; Cline, John F. ; Hoffman, Brian M. ; Kim, H. ; Morrobel-Sosa, A. ;

PERSONAL AUTHORS: Nalwa, Hari S. ; Dalton, Larry R. ; Schmidt, Werner F. ; Rabe, Johann G. ;

CONTRACT NO. AFOSR-82-0184, NSF-DMR82-06053

CONTRACT NO. AFOSR-82-0184, NSF-DMR82-06053

PROJECT NO. 2303

PROJECT NO. 2303

TASK NO. A3

TASK NO. A3

MONITOR: AFOSR TR-85-1201

MONITOR: AFOSR TR-85-1203

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Physical Chemistry, v89 p1994-1996 1985.

SUPPLEMENTARY NOTE: Pub. in Polymer Communications, v28 p240-242 Aug 85.

ABSTRACT: (U) The theory of Karplus and Fraenkel is employed to analyze the effect of on-site  $\pi$ - $\sigma$  electron Coulombic interactions in determining the <sup>13</sup>C and <sup>1</sup>H hyperfine interaction tensors for polyacetylene. Relative signs of hyperfine tensors have been determined by electron-nuclear-nuclear triple resonance experiments; theoretical analysis permits the absolute signs of all tensor elements to be unambiguously assigned. Moreover, it is shown that a <sup>13</sup>C and <sup>1</sup>H tensor can be self-consistently associated pairwise with a given unpaired spin density at carbon.

ABSTRACT: (U) Interest in the electrical properties of highly conjugated polymers has increased rapidly during the past few years, since these materials display unusual semiconducting characteristics. The electrical conductivity synthesized polypyrrole was measured as a function of temperature yielding an activation energy of 0.87 eV. A plot of conductivity versus T to the -1/4 power gives a straight line, indicating the Mott-conduction mechanism. Optical absorption spectra are reported.

DESCRIPTORS: (U) \*ACETYLENE, \*POLYMERS, \*SPIN STATES, \*QUANTUM THEORY, \*TENSORS, HYDROGEN, ISOTOPES, HYPERFINE STRUCTURE, ELECTRONS, CARBON, DENSITY, SIGNS AND SYMPTOMS, THEORY, CONDUCTIVITY, DEFECTS(MATERIALS), PARAMAGNETIC RESONANCE, REPRINTS

DESCRIPTORS: (U) \*PYRROLES, \*POLYMERS, \*SEMICONDUCTORS, ELECTRICAL CONDUCTIVITY, ELECTRICAL PROPERTIES, PLOTTING, OPTICS, FUNCTIONS, TEMPERATURE, ABSORPTION SPECTRA, VISIBLE SPECTRA, REPRINTS

IDENTIFIERS: (U) Electron coulomb interactions, Coulomb interactions, PE81102F, WUAFOSR2303A3

IDENTIFIERS: (U) PE81102F, WUAFOSR2303A3

AD-A162 895

AD-A162 894

## UNCLASSIFIED

PAGE 32 EVK551

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 893

7/3

WISCONSIN UNIV-MADISON DEPT OF CHEMISTRY

- (U) Organosilane High Polymers: Oxidation of Polycyclohexylmethylsilylene,

85

8P

PERSONAL AUTHORS: Trefonas, Peter, III; West, Robert;

CONTRACT NO. F49620-83-C-0044

PROJECT NO. 2303

TASK NO. 82

MONITOR: AFOSR  
TR-85-1195

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Polymer Science: Polymer Letters Edition, v23 p469-473 1985.

ABSTRACT: (U) Oxidation of poly(cyclohexyl(methyl)silylene) with m-chloroperbenzoic acid in chloroform gave polymers which contained siloxane as well as silicon-silicon bonds in the main chain. The ultraviolet spectra of the products suggest that blocklike copolymers of (cyclohexylSiMe)n and (cyclohexylSiMe-O-)n units are produced.

DESCRIPTORS: (U) \*POLYMERS, \*SILANES, \*OXIDATION, CYCLIC COMPOUNDS, CHEMICAL BONDS, HEXYL RADICALS, METHYL RADICALS, CHLOROFORM, COPOLYMERS, ORGANIC COMPOUNDS, ULTRAVIOLET SPECTRA, SILOXANES, SILICON, SILICON DIOXIDE, REPRINTS

IDENTIFIERS: (U) Silylene/Polycyclohexylmethyl, PE61102F, WUAFOSR230382

AD-A162 893

UNCLASSIFIED

AD-A162 892

PAGE 33

EVK551

AD-A162 892 7/4 7/5

COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY

- (U) The Dynamics of Barrier Crossings in Solution: The Effect of a Solvent Polarity-Dependent Barrier,

APR 85 8P

PERSONAL AUTHORS: Hicks, Janice; Vandersall, Mark; Babarogic, Zoran; Eisenthal, Kenneth B.;

CONTRACT NO. AFOSR-84-0013

PROJECT NO. 2303

TASK NO. 82

MONITOR: AFOSR  
TR-85-1154

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Chemical Physics Letters, v116 n1 p18-24, 26 Apr 85.

ABSTRACT: (U) Experiments on the role of the solvent in the dynamics of photoisomerization involving large dipole moment changes are discussed. Variation of the photoisomerization dynamics of dimethylaminobenzonitrile in a series of solvents is attributed chiefly to polarity-induced barrier height changes rather than viscosity changes. Implications of these findings regarding the use of barrier crossing theories are discussed. (Author)

DESCRIPTORS: (U) \*PHOTOCHEMICAL REACTIONS, \*ISOMERIZATION, \*BENZONITRILES, \*SOLVENTS, METHYL RADICALS, POLARITY, BARRIERS, CROSSINGS, THEORY, DIPOLE MOMENTS, DYNAMICS, VISCOSITY, SOLUTES, CHARGE TRANSFER, REPRINTS

IDENTIFIERS: (U) Benzonitrile/dimethylamino, PE61102F, WUAFOSR230382

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 876 12/1

AD-A162 875 7/4 12/1

FLORIDA STATE UNIV TALLAHASSEE DEPT OF STATISTICS

NORTH CAROLINA UNIV AT CHAPEL HILL CENTER FOR STOCHASTIC PROCESSES

(U) Peakedness of Weighted Averages of Jointly Distributed Random Variables.

(U) Fluctuations Near Homogeneous States of Chemical Reactions with Diffusion.

DESCRIPTIVE NOTE: Technical rept.,

DESCRIPTIVE NOTE: Technical rept.,

OCT 85 10P

NOV 85 31P

PERSONAL AUTHORS: Chan, Wai ; Park, Dong Ho ; Proschan, Frank ;

PERSONAL AUTHORS: Kotelenetz, Peter ;

REPORT NO. FSU-STATISTICS-M712, TR-85-184

REPORT NO. TR-126

CONTRACT NO. F49620-82-K-0007

CONTRACT NO. F49620-85-C-0144

PROJECT NO. 2304

PROJECT NO. 2304

TASK NO. A5

TASK NO. A5

MONITOR: AFOSR

MONITOR: AFOSR  
TR-85-1123

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Prepared in cooperation with Nebraska Univ., Lincoln. Dept. of Statistics and Ohio State Univ., Columbus. Dept. of Statistics.

UNCLASSIFIED REPORT

ABSTRACT: (U) Conditions are given under which a space-time jump Markov process describing the stochastic model of nonlinear chemical reactions with diffusion converges to the homogeneous state solution of the corresponding reaction-diffusion equation. The deviation is measured by a central limit theorem. This limit is a distribution valued Ornstein-Uhlenbeck process and can be represented as the mild solution of a certain stochastic partial differential equation.

DESCRIPTORS: (U) \*CHEMICAL REACTIONS, \*MARKOV PROCESSES, \*DIFFUSION, LIMITATIONS, THEOREMS, HOMOGENEITY, SOLUTIONS(GENERAL), NONLINEAR SYSTEMS, PARTIAL DIFFERENTIAL EQUATIONS, STOCHASTIC PROCESSES, MATHEMATICAL MODELS

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A5

AD-A162 876

AD-A162 875

UNCLASSIFIED

PAGE 34

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 874

7/3

TEXAS UNIV AT AUSTIN DEPT OF CHEMISTRY

(U) Does Chair Cyclo-octatetraene Exist?

85

3P

PERSONAL AUTHORS: Devar, Michael J. S. ; Merz, Kenneth M. , Jr.;

CONTRACT NO. F49620-83-C-0024

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-85-1011

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in the Jnl. of the Chemical Society, Chemical Communications, p343-344 1985.

ABSTRACT: (U) MINDO/3 and MNDO calculations are reported for chair cyclo-octatetraene (CIS-1,5-trans-3,7-cyclo-octatetraene) and for its conversions into the normal tubal(1 cis) isomer and into bicyclo(4.2.0) octa-2,4,7-triene.

DESCRIPTORS: (U) \*CYCLIC COMPOUNDS, QUANTUM CHEMISTRY, MINDO MOLECULAR ORBITALS, ISOMERS, HEAT OF FORMATION, REPRINTS

IDENTIFIERS: (U) Octatetraenes, Octatrienes, MINDO(Modified Intermediate Neglect of Differential Overlap), MNDO(Modified Neglect of Differential Overlap), PE81102F, WJAFOSR2303B2

AD-A162 874

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AD-A162 873

7/3

7/2

BRISTOL UNIV (ENGLAND) DEPT OF INORGANIC CHEMISTRY

(U) Cluster Complex Metathesis. Synthesis, Structures, and Dynamic Behaviour of Bi- and Tri-Metallic Hexanuclear Cluster Complexes (MM'Ru<sub>4</sub>(millimicron3-H)<sub>2</sub>(CO)<sub>12</sub>(PPh<sub>3</sub>)<sub>2</sub>) (M == M' == Cu, Ag, or Au; M == Cu, M' == Ag or Au; M == Ag, M' == Au).

83

5P

PERSONAL AUTHORS: Freeman, Mark J. ; Green, Michael ; Drphen, A. Guy ; Salter, Ian D. ; Stone, F. Gordon A. ;

CONTRACT NO. AFOSR-82-0070

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-85-1137

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in the Jnl. of the Chemical Society, Chemical Communications, p1331-1334 1983.

ABSTRACT: (U) The hexanuclear metal clusters (MM'Ru<sub>4</sub>(mu<sub>3</sub>-H)<sub>2</sub>(CO)<sub>12</sub>(PPh<sub>3</sub>)<sub>2</sub>) (M = M' = Cu, Ag, or Au; M = Cu, M' = Ag or Au; M = Ag, M' = Au) have been prepared by treating the dianion (Ru<sub>4</sub>(mu-H)<sub>2</sub>(CO)<sub>12</sub>(2-) with the complexes (MX(PPh<sub>3</sub>)<sub>3</sub>) (M = Au or Cu, X = Cl; M = Ag, X = I) in the presence of TIPF<sub>6</sub>; the trimetallic clusters may alternatively be synthesised by metathesis of the two appropriate bimetallic species, and the crystal structure of the compounds with the metal cores Cu<sub>2</sub>Ru<sub>4</sub>, Ag<sub>2</sub>Ru<sub>4</sub>, and CuAgRu<sub>4</sub> have been established by X-ray diffraction. Keywords: Cluster complex metathesis; Reprints.

DESCRIPTORS: (U) \*METAL COMPLEXES, \*SYNTHESIS(CHEMISTRY), ANIONS, METALS, CLUSTERING, REPRINTS, CHEMICAL REACTIONS, CRYSTAL STRUCTURE, SYNTHESIS

IDENTIFIERS: (U) Metathesis, PE81102F, WJAFOSR2303B2

AD-A162 873

PAGE 35

EVK551

UNCLASSIFIED

OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 872 20/8

AD-A162 872 CONTINUED

PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF CHEMISTRY

(U) Velocity Dependence of Azimuthal Anisotropies in Ion Scattering from Rhodium (111).

85 14P

DESCRIPTORS: (U) \*CATIONS, \*ION BOMBARDMENT, \*ION ION INTERACTIONS, PARTICLES, ARGON, ANISOTROPY, AZIMUTH, HELIUM, IONS, NEON, ANGLES, ORIENTATION(DIRECTION), COLLISIONS, TIME, SCATTERING, COMPUTATIONS, DYNAMICS, MOLECULAR PROPERTIES, NEUTRALIZATION, PROBABILITY, QUALITATIVE ANALYSIS, RATIOS, YIELD, RHODIUM, VELOCITY, PARTICLES, REPRINTS, CRYSTALS

PERSONAL AUTHORS: Chang, Che-Chen ; DeLouise, Lisa A. ; Winograd, Nicholas ; Garrison, Barbara J. ;

IDENTIFIERS: (U) \*Ion scattering, PE81102F, WUAFOSR2303A2

CONTRACT NO. AFOSR-85-0028

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR TR-85-1158

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Surface Science, v154 p22-34 1985.

ABSTRACT: (U) The scattering of He<sup>+</sup>, Ne<sup>+</sup> and Ar<sup>+</sup> ions from Rh (111) is measured as a function of the azimuthal angle of the primary ion for an incident polar angle of 70 deg from the surface normal and an inplane collection angle of 60. In this case anisotropy is defined as the ratio of yield of ions scattered having the azimuth of (110) to the yield of the those having the azimuth of (211). The yield ratio for all particle types correlates with particle velocity. The ratio is approx. 1 at low velocities, decreases to approx. 0.2 at 8000000 cm/s and then increases to a value of 1.4 at 25000000 cm/s. Molecular dynamics calculations have been performed for Ne<sup>+</sup> ion scattering from Rh(111) in order to understand the changes in anisotropy with particle velocity. Qualitative agreement with the experimental results is obtained without having to account for neutralization. A neutralization probability that depends on the collision time improves the agreement between the calculated and experimental yield ratios. A velocity dependent probability will not affect the ratio of yields in two different azimuthal directions. Keywords: Reprints; Neon; Helium; Argon; Rhodium; Ion scattering.

AD-A162 872

AD-A162 872

UNCLASSIFIED

PAGE 38

EVK551



## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 869 12/1 20/4

AD-A162 868 12/1

RENSELAER POLYTECHNIC INST TROY NY DEPT OF MATHEMATICAL SCIENCES

NORTH CAROLINA UNIV AT CHAPEL HILL DEPT OF STATISTICS

(U) Non-Linear Systems in Infinite Dimensional State Spaces.

(U) On a Joint Strong Approximation Theorem for Record and Inter-Record Times.

DESCRIPTIVE NOTE: Final rept. 15 Jun 81-14 Sep 85.

DESCRIPTIVE NOTE: Technical rept..

OCT 85 9P

OCT 85 15P

PERSONAL AUTHORS: Slemrod, M. ;

PERSONAL AUTHORS: Pfeifer, Dietmar ;

CONTRACT NO. AFOSR-81-0172

REPORT NO. TR-120

PROJECT NO. 2304

CONTRACT NO. F49820-85-C-0144

TASK NO. A1

PROJECT NO. 2304

MONITOR: AFOSR

MONITOR: AFOSR

TR-85-1121

MONITOR: TR-85-1180

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) During the period covered by this grant the principal investigator wrote 17 papers. Titles include: Scanning Control of a Vibrating String, Dynamic Phase Transitions in a Van Der Waals Fluid, The Viscosity-capillarity Admissibility for Shocks and Phase Transitions, Lax-Friedrichs and the Viscosity-capillarity Criteria and Temporal and Spatial Chaos in a Van der Waals Fluid due to Periodic Thermal Fluctuations.

ABSTRACT: (U) This report presents a simple joint strong approximation for the logarithms of record and inter-record times from an exchangeable sequence, including an exact estimation for the rate of convergence in terms of upper and lower class functions of a Wiener process. The approach chosen here allows for simple proofs of exact and asymptotic (joint) results for record and inter-record times, such as the Law of Large Numbers, Central Limit Theorem and Law of the Iterated Logarithm, and others. Keywords: Markov chains; Stochastic processes; Random variables. (Author)

DESCRIPTORS: (U) \*NONLINEAR ANALYSIS, VISCOSITY, CAPILLARITY, SHOCK, DYNAMICS, PHASE TRANSFORMATIONS, NONLINEAR SYSTEMS, VIBRATION, SIZES(DIMENSIONS), PERIODIC VARIATIONS, THERMAL PROPERTIES, CONTROL, SCANNING

DESCRIPTORS: (U) \*APPROXIMATION(MATHEMATICS), THEOREMS, RANDOM VARIABLES, LIMITATIONS, MARKOV PROCESSES, CONVERGENCE, RATES, LOGARITHM FUNCTIONS, FUNCTIONS(MATHEMATICS)

IDENTIFIERS: (U) Van der Waals fluids, PE81102F, WUAFOSR2304A1

IDENTIFIERS: (U) Markov chains, Wiener processes, PE81102F, WUAFOSR2304A5

AD-A162 869

AD-A162 868

UNCLASSIFIED

PAGE 37 EVK551

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 850 20/9 9/1

AD-A162 840 4/2

STEVENS INST OF TECH HOBOKEN N J

CONTROL DATA CORP MINNEAPOLIS MN

(U) Mega-Amp Opening Switch with Nested Electrodes/Pulsed Generator of Ion and Ion Cluster Beams.

(U) Evidence for Coexisting Spectra of Stratified Turbulence and Internal Waves in Mesoscale Atmospheric Velocity Fields.

DESCRIPTIVE NOTE: Annual rept. 1 Jul 84-30 Jun 85.

NOV 85 5P

JUL 85 36P

PERSONAL AUTHORS: Nardl, V. ; Luo, C. M. ; Powell, C. ;

PERSONAL AUTHORS: Gage, K. S. ; Nastrom, G. D. ;

CONTRACT NO. AFOSR-84-0228

CONTRACT NO. F49620-82-C-0029

PROJECT NO. 2301

PROJECT NO. 2310

TASK NO. A7

TASK NO. A1

MONITOR: AFOSR

MONITOR: AFOSR  
TR-85-1188

TR-85-1125

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) During the first year of the research program on the use of a plasma focus machine (PF) as a M Amp opening switch we have: (A) Improved the performance of our presently functioning system by finding a new method of increasing the surge of anamalous (i.e., noncollisional) resistivity which controls the switch opening function (specifically, the rate of disintegration of the PF pinch where the current is concentrated). (B) Devised new methods to monitor the rate of disintegration of the PF pinch via the changes of the particle emission spectra as a function of time (on a nanosecond scale) and of position (on a 50 micrometer scale) inside the pinch. (C) Made substantial progress in the construction of an upgraded system which can operate at higher current levels as compared to the present 0.5 - 0.7 MA. (Author)

DESCRIPTORS: (U) \*ELECTRONIC SWITCHES, \*PLASMA DEVICES, ELECTRODES, CLUSTERING, ION BEAMS, PARTICLE SPECTRA, ELECTRICAL RESISTANCE, TIME DEPENDENCE, DISINTEGRATION, RATES, OPENING(PROCESS), SWITCHING, PULSE GENERATORS, PINCH EFFECT

IDENTIFIERS: (U) Nanosecond time, PE81102F, WUAFOSR2301A7

AD-A162 850

AD-A162 840

UNCLASSIFIED

PAGE 38

EVK551

SUPPLEMENTARY NOTE: Pub. in Symposium on Turbulence and Diffusion (7th) p176-179 12-15 Nov 85.

ABSTRACT: (U) This paper briefly reviews recently determined spectra of mesoscale horizontal winds. The implication of recently determined vertical velocity spectra as they pertain to the wave/turbulent processes which determine the mesoscale spectrum of atmospheric motions. It has been found that the mesoscale spectrum of atmospheric motions is dominated by quasi-horizontal eddies with pronounced vertical structure. Whenever the quasi-horizontal surfaces become inclined as in upper level frontal zones, vertical mixing will take place depending on the slope of the mixing surfaces. Keywords: Stratified turbulence; internal waves; mesoscale; Reprints.

DESCRIPTORS: (U) \*WIND, \*ATMOSPHERIC MOTION, HORIZONTAL ORIENTATION, WIND VELOCITY, EDDIES(FLUID MECHANICS), SLOPE, MIXING, SURFACES, SPECTRA, STRATIFICATION, TURBULENCE, FRONTS(METEOROLOGY), STRUCTURAL PROPERTIES, VERTICAL ORIENTATION, WAVES, INTERNAL WAVES, REPRINTS, VELOCITY

IDENTIFIERS: (U) Mesometeorology, Stratified turbulence, PE81102F, WUAFOSR2310A1

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

## SEARCH CONTROL NO. EVK551

AD-A162 837

12/1

SOUTH CAROLINA UNIV COLUMBIA DEPT OF MATHEMATICS AND STATISTICS

(U) Some Convergence Results for Kernel-Type Quantile Estimators under Censoring.

DESCRIPTIVE NOTE: Technical rept.,

NOV 85 18P

PERSONAL AUTHORS: Lio, Y. L.; Padgett, W. J.;

REPORT NO. TR-108

CONTRACT NO. AFOSR-84-0156, MIPR-ARO-139-85

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR

TR-85-1122

## UNCLASSIFIED REPORT

ABSTRACT: (U) Based on right-censored data from a lifetime distribution, a kernel-type estimator of a certain quantile function is studied. This estimator is smoother than a product-limit quantile function. This document also covers: asymptotic normality; asymptotic mean equivalence; and mean square convergence. Keywords: probability distribution; kernel functions.

DESCRIPTORS: (U) \*KERNEL FUNCTIONS, ASYMPTOTIC NORMALITY, PROBABILITY DISTRIBUTION FUNCTIONS, CONVERGENCE, MEAN, ESTIMATES

IDENTIFIERS: (U) Quantiles, PE61102F, WUAFOSR2304A5

AD-A162 837

## UNCLASSIFIED

AD-A162 834

PAGE

39

EVK551

AD-A162 834

12/1

FLORIDA UNIV GAINESVILLE

(U) Applications of Differential Topology to Grid Generation.

DESCRIPTIVE NOTE: Final rept. 1 Jun 83-31 May 84.

NOV 85 48P

PERSONAL AUTHORS: Wilson, D. C.;

CONTRACT NO. AFOSR-83-0158

PROJECT NO. 2304

TASK NO. D9

MONITOR: AFOSR

TR-85-1165

## UNCLASSIFIED REPORT

ABSTRACT: (U) The purpose of this paper is to indicate how smoothing techniques from Differential Topology can be applied to the area of algebraic grid generation in Computational Fluid Dynamics. The basic method is to patch together one global grid from a number of smaller ones. The smoothing theory allows one to blend the grid from one section into the grid of an adjacent one. Keywords: X-24C aircraft; Simpson's rule; Wing body configurations; Computations; Convolution integrals. (Author)

DESCRIPTORS: (U) \*DIFFERENTIAL TOPOLOGY, ALGEBRA, GRIDS, COMPUTATIONS, FLUID DYNAMICS, CONVOLUTION INTEGRALS, GLOBAL, WING BODY CONFIGURATIONS

IDENTIFIERS: (U) X-24C aircraft, Simpsons rule, Smoothing(Mathematics), PE61102F, WUAFOSR2304D9

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 833

12/1

AD-A162 831

7/4

NORTH CAROLINA UNIV AT CHAPEL HILL CENTER FOR STOCHASTIC PROCESSES

PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF CHEMISTRY

(U) Product Stochastic Measures.

(U) Adsorption and Desorption of NO from Rh(111) and Rh(331) Surfaces.

DESCRIPTIVE NOTE: Technical rept.,

DESCRIPTIVE NOTE: Technical rept.,

OCT 85

30P

85 16P

PERSONAL AUTHORS: Perez-Abreu, Victor ;

PERSONAL AUTHORS: DeLouise, Lisa A. ; Winograd, Nicholas ;

REPORT NO. TR-118

CONTRACT NO. AFOSR-85-0028

CONTRACT NO. F49620-85-C-0144

PROJECT NO. 2304

PROJECT NO. 2303

TASK NO. A5

TASK NO. A2

MONITOR: AFOSR

MONITOR: AFOSR  
TR-85-1155

TR-85-1178

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) The concept of symmetric tensor product of a Hilbert space is used to construct a product measure of orthogonally scattered measures. The result is applied to the construction of an sq L-valued product stochastic measure (p.s.m.) of non-identically distributed sq-L-valued independently scattered measures. Using the theory of vector valued measures we construct multiple integrals with respect to the p.s.m. A relationship between the theory of multiple stochastic integrals and the theory of vector valued measures is established. Keywords: exponential space; orthogonality.

DESCRIPTORS: (U) \*STOCHASTIC PROCESSES, ORTHOGONALITY, SCATTERING, SYMMETRY, TENSORS, HILBERT SPACE, VECTOR ANALYSIS, INTEGRALS

SUPPLEMENTARY NOTE: Pub. in Surface Science, v159 p189-213 1985.

ABSTRACT: (U) The adsorption and desorption chemistry of NO on the clean Rh(111) and Rh(331) single crystal surfaces was followed with SIMS, XPS, and LEED. Results suggest dissociative NO adsorption occurs at step and/or defect sites. At saturation coverage there was approx. 10 times more dissociated species on the Rh(331) surface at 300 K than on the Rh(111) surface. On both surfaces two molecular states of NO sub ads have been identified as Beta1 and Beta2 which possess different chemical reactivity. Under the condition of saturation coverage the Beta1 and Beta2 states are populated on the Rh(111) surface in a different proportion than on the Rh(331) surface. Further, their population on both surfaces is coverage and temperature dependent. When the sample is heated to desorb the saturation overlayer formed on the Rh(111) and Rh(331) crystal surfaces, approximately 50% of the overlayer is found to desorb below approx. 400 K primarily from the Beta2 state, molecularly as NO(g). Between 300 and 400 K the Beta1 state dissociates as binding sites necessary to coordinate N sub ads and O sub ads are freed by desorption of NO(g). (Author)

AD-A162 833

AD-A162 831

## UNCLASSIFIED

PAGE 40

EVK551

UNCLASSIFIED

OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 831 CONTINUED

AD-A162 830 4/1

DESCRIPTORS: (U) \*ADSORPTION, \*DESORPTION, \*NITROGEN  
OXIDES, CHEMICAL REACTIONS, REACTIVITIES,  
DEFECTS(MATERIALS), SITES, CHEMISTRY, MOLECULAR STATES,  
SURFACES, CHEMICAL DISSOCIATION, CHEMISORPTION, SURFACE  
CHEMISTRY, RHODIUM, SINGLE CRYSTALS, SATURATION, REPRINTS

PHYSICAL DYNAMICS INC BELLEVUE WA

(U) Fluxes of Heat and Constituents Due to Convectively  
Unstable Gravity Waves,

MAR 85 9P

IDENTIFIERS: (U) PE81102F, WUAFOSR2303A2

PERSONAL AUTHORS: Fritts, David C. ; Dunkerton, Timothy J. ;

CONTRACT NO. F49620-83-C-0061

PROJECT NO. 2310

TASK NO. A1

MONITOR: AFOSR  
TR-85-1164

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the Atmospheric  
Sciences, v42 n6 p549-558, 15 Mar 85.

ABSTRACT: (U) We consider the implications of a  
nonuniform turbulent diffusion due to the local  
saturation of a gravity wave via convective instabilities.  
It is found that both wave and turbulence fluxes of heat  
can be reduced dramatically, depending on the amplitude  
of the wave motion and the extent to which the turbulent  
diffusion is localized. These results suggest that  
previous studies that assumed a uniform turbulent  
diffusion may have over-estimated the heat and  
constituent fluxes due to gravity wave saturation.  
Keywords: Gravity wave breakdown; Mesosphere; Reprints.

DESCRIPTORS: (U) \*GRAVITY WAVES, \*MESOSPHERE, TURBULENT  
DIFFUSION, CONVECTION(ATMOSPHERIC), STABILITY, HEAT  
TRANSFER, LAPSE RATE, REPRINTS

IDENTIFIERS: (U) PE81102F, WUAFOSR2310A1

AD-A162 831

AD-A162 830

UNCLASSIFIED

PAGE 41 EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 829 11/10 20/11

AD-A162 829 CONTINUED

STANFORD UNIV CA DEPT OF CHEMISTRY

(U) Network Topology and the Theory of Rubber Elasticity.

DESCRIPTIVE NOTE: Rept. for 1 Oct 84-30 Sep 85.

SEP 85 9P

PERSONAL AUTHORS: Flory, Paul J. ;

CONTRACT NO. AFOSR-82-0009

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-TR-85-1163

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in British Polymer Jnl., v17 n2  
p96-102 1985.

ABSTRACT: (U) The high extensibility coupled with the capacity for full recovery implied by the term 'rubber elasticity' is exhibited by nearly all polymers under suitable conditions. Moreover, it is a property manifested exclusively by polymers consisting of long chains combined in a network. Although the chemical units comprising various elastomers differ widely, their mechanical properties have much in common. This is especially evident in their stress-strain relationships. The density of junctions, or crosslinkages, in elastomeric networks generally is low, typically being in the range 0.05-0.2 mol/kg. Yet the degree of interlinking places them far beyond the gel point. It is purposeful to characterize the constitution of the network in a way that comprehends network imperfections. The cycle rank of the network, defined as in graph theory, turns out to be the appropriate universal measure of the network connectivity. A feature of elastomer networks that is second in importance only to the degree of connectivity, or the cycle rank, is the copious interpenetration of the chains comprising them. Chains emanating from a given junction of the network are embedded in a maze of other chains and junctions. Inquiry into the theory of rubber elasticity brings to light special aspects of the

AD-A162 829

AD-A162 829

UNCLASSIFIED

PAGE

42

EVK551

structure and topology of polymeric networks which might otherwise pass unnoticed.

DESCRIPTORS: (U) \*TOPOLOGY, \*ELASTIC PROPERTIES, \*RUBBER, POLYMERS, DENSITY, JUNCTIONS, ELASTOMERS, NETWORKS, RECOVERY, GRAPHS, THEORY, CYCLES, GELS, MECHANICAL PROPERTIES, RUBBER, STRESS STRAIN RELATIONS, CHEMICAL BONDS, CROSSLINKING(CHEMISTRY), EQUATIONS OF STATE, REPRINTS

IDENTIFIERS: (U) PE81102F, WUAFOSR2303A3

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 827 12/1

AD-A162 819 4/1

MASSACHUSETTS UNIV AMHERST

UTAH STATE UNIV LOGAN

(U) Final Report on Air Force Research Grant AFOSR-84-0059.

(U) Rocket-Borne Measurements of Atmospheric Infrared Fluxes,

DESCRIPTIVE NOTE: Final rept. 29 Jan 84-28 Jul 85,

SEP 85 4P

FEB 85 11P

PERSONAL AUTHORS: Berger, M. S. ;

PERSONAL AUTHORS: Utwick, J. C. ; Baker, K. D. ; Stair, A. T. ,  
Jr.; Frings, W. ; Hennig, R. ;

CONTRACT NO. AFOSR-84-0059

CONTRACT NO. F49620-83-C-0122

PROJECT NO. 2304

PROJECT NO. 2310

TASK NO. A4

TASK NO. A2

MONITOR: AFOSR  
TR-85-1109MONITOR: AFOSR  
TR-85-1182

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) In this brief report an investigator indicates that he wrote eleven research papers. Titles included, 'Vortex phenomena', 'Some nonlinear analytic aspects of VLSI semiconductor device modeling', 'The confinement problem in nonlinear gauge theories and 'New ideas in the calculus of variations in the large' 'Variational principles for equilibrium figures of fluid without symmetry assumptions'. Keywords: Nonlinear partial differential equations; bifurcation (Mathematics; gauge theories). (author)

DESCRIPTORS: (U) \*AIR FORCE RESEARCH, CALCULUS OF VARIATIONS, CONFINEMENT(GENERAL), EQUILIBRIUM(GENERAL), FLUIDS, GAGES, MODELS, NONLINEAR DIFFERENTIAL EQUATIONS, NONLINEAR SYSTEMS, PARTIAL DIFFERENTIAL EQUATIONS, SEMICONDUCTOR DEVICES, THEORY, VARIATIONAL PRINCIPLES, VORTICES, MATHEMATICAL ANALYSIS, BIFURCATION(MATHEMATICS)

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A4

SUPPLEMENTARY NOTE: Pub. in Jnl. of Atmospheric and Terrestrial Physics, v47 n1-3 p121-131, 1985.

ABSTRACT: (U) In the Energy Budget Campaign two rockets, one from Andoya rocket Range, Norway, and one from Esrange, Sweden, each carrying a liquid helium cooled infrared spectrometer, were simultaneously launched as part of Salvo B. The launches occurred during the recovery phase of the last of four auroral magnetic events after a Joule heating criteria was exceeded. At Andoya, zenith radiance altitude profiles were obtained of nitric oxide (NO) near 5.4 microns from 70 to 185 km (rocket apogee), of ozone (O3) near 9.6 microns from 70 to 105 km (instrument sensitivity) and of carbon dioxide (CO2) near 15 microns from 70 to 150 km (instrument sensitivity). Measured CO2 spectra at 72 km are shown to compare favorably to those calculated for local thermodynamic equilibrium conditions and instrument resolution. By comparing Andoya and Esrange CO2 radiance profiles there is evidence for spatial variation in the emission. It is also shown that the very distributed conditions of salvo B prior to and during these launches appears to have significantly changed the 03 9.6 microns radiance profiles compared to previous rocket measurements in polar disturbed and quiet atmospheres. Using no radiance profiles and spectrum, previous rocket results and computed models, it is shown that no radiance

AD-A162 827

AD-A162 819

## UNCLASSIFIED

PAGE 43 EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A182 819 CONTINUED

Increase could be detected from prompt auroral energy deposition. The results support the theory that the NO density in auroral regions is significantly enhanced over mid-latitude values and that for weak auroras, the reaction  $\text{NO}(\nu=0) + \text{O}$  yields  $\text{NO}(\nu=1) + \text{O}$  is the dominant radiation mechanism. Keywords: Energy transfer; Infrared radiation; Upper atmosphere; Energy budgets. (Reprints)

DESCRIPTORS: (U) \*RADIANT FLUX DENSITY, \*ENERGY TRANSFER, \*INFRARED RADIATION, \*AURORAE, ATMOSPHERIC PHYSICS, ATMOSPHERIC CHEMISTRY, INFRARED SPECTROSCOPY, MODELS, ENERGY CONSERVATION, HEATING, CARBON DIOXIDE, ATMOSPHERIC DISTURBANCES, EQUILIBRIUM(GENERAL), THERMODYNAMICS, NITROGEN OXIDES, POLAR REGIONS, ATMOSPHERES, PROFILES, RADIANCE, APOGEE, ROCKETS, SPATIAL DISTRIBUTION, OZONE, RADIATION, REPRINTS, MEASUREMENT, ROCKETBORNE, UPPER ATMOSPHERE, ALTITUDE, PROFILES, BUDGETS, INSTRUMENTATION

IDENTIFIERS: (U) PE81102F, WUAFOSR2310A2

AD-A182 818 12/1

COLORADO STATE UNIV FORT COLLINS DEPT OF ATMOSPHERIC SCIENCE

(U) Vertical Interpolation of Meteorological Variables in Low-Resolution Numerical Models,

JUN 85 9P

PERSONAL AUTHORS: Shen, Rujin ; Reiter, Elmar R. ; Bresch, James F. ;

CONTRACT NO. AFOSR-82-0182, NSF-ATMB3-13270

PROJECT NO. 2310

TASK NO. A1

MONITOR: AFOSR  
TR-85-1018

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Conference on Numerical Weather Prediction (7th), p538-542, 17-20 Jun 85.

ABSTRACT: (U) The initialization of numerical prediction models usually requires the transformation of variables observed in a p-coordinate system into some other coordinate frame of reference (e.g., delta-coordinates or theta-coordinates). Such transformations require the application of interpolation or curve-fitting techniques. This reprint demonstrates that the choice of an appropriate interpolation scheme can become a critical issue for the skill of a low-resolution prediction model.

DESCRIPTORS: (U) \*INTERPOLATION, CURVE FITTING, LOW RESOLUTION, MATHEMATICAL MODELS, METEOROLOGICAL DATA, VARIABLES, TRANSFORMATIONS(MATHEMATICS), COORDINATES, MATHEMATICAL PREDICTION, NUMERICAL ANALYSIS, VERTICAL ORIENTATION, REPRINTS

IDENTIFIERS: (U) PE81102F, WUAFOSR2310A1

AD-A182 819

AD-A182 818

UNCLASSIFIED

PAGE 44

EVK551



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 817 7/3 15/2

AD-A162 818 7/4 20/8 20/10

VANDERBILT UNIV NASHVILLE TN DEPT OF CHEMISTRY

UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES DEPT OF CHEMISTRY

(U) The Ab Initio Structure of O-Methyl Methylphosphonofluoridate.

(U) Electron Nuclear Double Resonance Spectra of Cis-Rich and Trans-Rich Polyacetylenes between 1.9 and 4.2 K,

85 10P

FEB 85 4P

PERSONAL AUTHORS: Ewig, Carl S.; Wazer, John R. van;

PERSONAL AUTHORS: Cline, John F.; Thomann, Hans; Kim, H.; Morrobel-Sosa, A.; Dalton, Larry R.;

CONTRACT NO. AFOSR-82-0100

PROJECT NO. 2303

CONTRACT NO. AFOSR-82-0184, NSF-PCM81-16108

TASK NO. 82

PROJECT NO. 2303

MONITOR: AFOSR TR-85-1153

MONITOR: AFOSR TR-85-1202

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Molecular Structure (Theochem), v122 p179-187 1985.

SUPPLEMENTARY NOTE: Pub. in Physical Review B, v31 n3 p1805-1807, 1 Feb 85.

ABSTRACT: (U) The molecular structure of O-methyl methylphosphonofluoridate,  $(CH_3)P(O)(F)(OCH_3)$ , has been determined from ab initio SCF calculations. It is the simplest realistic model for all acetylcholinesterase enzyme inhibitors based on methylphosphonofluoridic acid. Structures obtained in STO-3G and 3-21G basis sets are compared. Bond distances and angles agree well with the results of the single experimental study, the primary difference being torsional angles that determine conformation. The computation indicates an eclipsed conformation, the methyl adjacent to the phosphoryl oxygen. It is stabilized by cancellation of intramolecular dipoles. Evidence is presented that the experimental conclusion is incorrect and that an eclipsed conformation should be displayed by other phosphorus esters as well.

DESCRIPTORS: (U) \*CHOLINESTERASE INHIBITORS, \*ESTERS, \*MOLECULAR STRUCTURE, \*ORGANIC PHOSPHORUS COMPOUNDS, ENZYME INHIBITORS, CONFORMITY, PHOSPHORUS, ANGLES, TORSION, METHYL RADICALS, FLUORINE, NERVE AGENTS, REPRINTS

IDENTIFIERS: (U) Fluoridic acid/methylphosphono, PE61102F, WJAFOSR230382

AD-A162 817

AD-A162 818

UNCLASSIFIED

PAGE 45 EVK551

ABSTRACT: (U) The electron nuclear double resonance (ENDOR) spectra of cis-rich and trans-rich polyacetylenes have been recorded at temperatures in the range 4.2-1.9 K. The striking feature of these spectra is the similarity in both forms to the high-temperature ENDOR spectra of cis-rich polyacetylene reported previously. This observation demonstrates the existence of a common defect, a delocalized pi electron or soliton, in both materials. In the temperature range from 4.2 to 1.9 K, the hyperfine tensors are observed to be temperature independent for cis-rich polyacetylene. The hyperfine interactions for trans-rich polyacetylene observed to be temperature independent and can be characterized by a 1-K activation energy. At higher temperatures (6-300 K), the trans-polyacetylene material is characterized by a 400 K activation energy for modulation of the hyperfine interactions. The consequences of these results for current soliton theories are discussed.

DESCRIPTORS: (U) \*POLYMERS, \*ACETYLENES, \*ELECTRON SPECTROSCOPY, \*ELECTRON NUCLEAR DOUBLE RESONANCE, TENSORS, HYPERFINE STRUCTURE, INTERACTIONS, ACTIVATION ENERGY, QUANTUM THEORY, DEFECTS(MATERIALS), MODULATION, ELECTRONS,

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 816 CONTINUED

AD-A162 815 4/2

HIGH TEMPERATURE, TEMPERATURE, CONDUCTIVITY, SPIN STATES,  
WAVE FUNCTIONS, DIFFUSION, REPRINTS

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION GREENBELT  
MD GODDARD SPACE FLIGHT CENTER

IDENTIFIERS: (U) PE81102F, WJAFOSR2303A3

(U) Diagnosis of Ageostrophic Circulations in a Two-  
Dimensional Primitive Equation Model of Frontogenesis,

JUN 85 25P

PERSONAL AUTHORS: Keyser, Daniel ; Pecnick, Michael J. ;

CONTRACT NO. AFOSR-ISSA-84-00012

PROJECT NO. 2310

TASK NO. A1

MONITOR: AFOSR  
TR-85-1178

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the Atmospheric  
Sciences, v42 n12 p1284-1305, 15 Jun 85.

ABSTRACT: (U) In this reprint diagnoses are presented of  
the transverse ageostrophic circulation patterns for two  
cases from a two-dimensional primitive equation model of  
frontogenesis forced by a combination of confluence and  
horizontal shear. The cold advection case (the specified  
alongfront potential temperature gradient results in  
differential cold advection by the upper-level jet)  
realistically simulates upper-level frontogenesis in  
response to tilting by a cross-front gradient of  
subsidence. The warm advection case features a frontal  
system spanning the troposphere, which develops in  
response to differential horizontal advection. The  
diagnoses are performed by numerically solving three  
versions of the two-dimensional Sawyer-Eliassen equation  
for the streamfunction of the transverse ageostrophic  
circulation. The quasi-geostrophic and geostrophic  
momentum (GM) versions are based on the approximation of  
cross-front geostrophic balance, while the primitive  
equation (PE) version includes the possibility of an  
alongfront component of the ageostrophic flow, which is  
neglected.

DESCRIPTORS: (U) \*FRONTS(METEOROLOGY). \*MATHEMATICAL  
MODELS, \*GEOSTROPHIC WIND, TWO DIMENSIONAL, WIND SHEAR,

AD-A162 816

AD-A162 815

UNCLASSIFIED

PAGE 46

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 815 CONTINUED

AD-A162 814 4/2

REPRINTS, INVISCID FLOW, ADVECTION, LOW TEMPERATURE,  
EQUATIONS, CONFLUENCE, MOMENTUM, EQUATIONS, HORIZONTAL  
ORIENTATION, TEMPERATURE GRADIENTS, TROPOSPHERE, WIND

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION GREENBELT  
MD GODDARD SPACE FLIGHT CENTER

IDENTIFIERS: (U) Frontogenesis, Ageostrophic circulation,  
PE61102F, WUAFOSR2310A1

(U) A Two-Dimensional Primitive Equation Model of  
Frontogenesis Forced by Confluence and Horizontal  
Shear,

JUN 85 26P

PERSONAL AUTHORS: Keyser, Daniel ; Pecnick, Michael J. ;

CONTRACT NO. AFOSR-ISSA-84-00012

PROJECT NO. 2310

TASK NO. A1

MONITOR: AFOSR  
TR-85-1175

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the Atmospheric  
Sciences, v42 n12 p1259-1282, 15 Jun 85.

ABSTRACT: (U) In this reprint a two-dimensional  
primitive equation model of frontogenesis forced by a  
combination of confluence and horizontal shear is  
formulated for dry, nearly adiabatic and inviscid  
conditions. The frontogenetical forcing mechanisms are  
included by respectively specifying the cross-front and  
vertical variation of the cross-front geostrophic  
component is zero. The second and third cases  
respectively consist of negative and positive shear of  
the cross-front geostrophic component, which correspond  
to cold and warm advection at upper levels for the  
configuration of the alongfront wind component. The above  
frontogenetical forcing and the resulting frontal  
structures are related to typical flow patterns occurring  
within midlatitude baroclinic waves during various stages  
in their life cycle. Keywords: Tropopause folding;  
tilting effects.

DESCRIPTORS: (U) \*FRONTS(METEOROLOGY), \*MATHEMATICAL  
MODELS, TWO DIMENSIONAL, WIND SHEAR, REPRINTS, ADIABATIC  
CONDITIONS, INVISCID FLOW, PATTERNS, FLOW, LIFE CYCLES,  
TILT, VARIATIONS, VERTICAL ORIENTATION, EQUATIONS,  
HORIZONTAL ORIENTATION, FOLDING, TROPOPAUSE, WIND

AD-A162 815

AD-A162 814

UNCLASSIFIED

PAGE 47 EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 814 CONTINUED

AD-A162 811 9/2 12/2

IDENTIFIERS: (U) Frontogenesis, PE81102F, WUAF0SR2310A1

NORTHWESTERN UNIV EVANSTON IL DEPT OF MECHANICAL AND  
NUCLEAR ENGINEERING

(U) Computer-Aided Engineering.

JUN 85 6P

PERSONAL AUTHORS: Fong, H. H. ; Skalak, F. M. ; Liu, W. K. ;  
Leung, J. Y. ; Hsu, K. H. ;

MONITOR: AFOSR  
TR-85-1108

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Presented at Pressure Vessels and  
Piping Conference and Exhibition, New Orleans, LA 23-26  
Jun 85.

ABSTRACT: (U) The procedures for analog Monte Carlo  
simulation of Markov processes are examined. Two variance  
reduction techniques are then included in a nonanalog  
formulation to increase the sampling efficiency for  
highly reliable systems, and a method for incorporating  
uncertainty in failure and repair rate data is outlined.  
Models for three classes of component dependencies  
appearing in reliability and availability problems are  
incorporated into the Markov formulation. They are (1)  
shared repair crews between components, (2) load sharing  
between components, and (3) standby mode. Results are  
given for a series of model problems to demonstrate the  
efficiency of the methods as well as the effects of the  
dependencies on system unreliability and unavailability.

DESCRIPTORS: (U) \*MONTE CARLO METHOD, \*COMPUTER  
APPLICATIONS, \*MARKOV PROCESSES, \*SYSTEMS ENGINEERING,  
ANALOG SIMULATION, AVAILABILITY, CREWS, EFFICIENCY, RATES,  
REDUCTION, RELIABILITY, REPAIR, SAMPLING, SHARING,  
VARIATIONS, MAINTENANCE MANAGEMENT

AD-A162 814

AD-A162 811

UNCLASSIFIED

PAGE 48

EVK551

## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 809 7/4

AD-A162 808 12/1

NORTH DAKOTA STATE UNIV FARGO DEPT OF CHEMISTRY

YALE UNIV NEW HAVEN CT DEPT OF ELECTRICAL ENGINEERING

(U) Electronic Structure of the Phosphoryl and Thiophosphoryl Bonds.

(U) A 4(n+1)-Dimensional Model Reference Adaptive Control for the Stabilization of any Strictly Proper Minimum Phase Linear Systems with Relative Degree Not Exceeding Two and Dimension Not Exceeding n.

85 10P

PERSONAL AUTHORS: Schmidt, Michael W. ; Gordon, Mark S. ;

JUN 85 8P

CONTRACT NO. AFOSR-82-0190

PERSONAL AUTHORS: Morse, A. S. ;

PROJECT NO. 2303

CONTRACT NO. AFOSR-84-0242

TASK NO. B2

PROJECT NO. 2304

MONITOR: AFOSR  
TR-85-1144TASK NO. A1  
MONITOR: AFOSR  
TR-85-0959

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the American Chemical Society, v107 n7 p1922-1930 1985.

ABSTRACT: (U) The phosphoryl bond is presented as a resonance hybrid between singly and triply bound structures. The types of electronically excited states and a number of their potential surfaces can be understood within the confines of a singly bound model. However, a detailed analysis of the electronic distribution within the ground state shows significant contribution from the triply bound structure. In fact, increasing the electronegativity of the ligands at phosphorus increases the contribution of the triply bound structure, so that the P-O bond order approaches that of a double bond. The thiophosphoryl bond may be viewed in much the same manner but is rather weaker and contains less multiple bond character than does the P-O group.

DESCRIPTORS: (U) \*CHEMICAL BONDS, \*ELECTRONIC STATES, \*PHOSPHORUS, \*SULFUR, LIGANDS, STRUCTURAL PROPERTIES, SURFACES, DISTRIBUTION, ELECTRONICS, GROUND STATE, HYBRID SYSTEMS, RESONANCE, REPRINTS

IDENTIFIERS: (U) Electronegativity, PE81102F,  
WUAFOSR2303B2

AD-A162 809

AD-A162 808

UNCLASSIFIED

PAGE 49

EVK551

ABSTRACT: (U) In a recent paper it was shown that there are smooth, nonlinear, three-dimensional controllers, not incorporating probing signals, which are capable of adaptively stabilizing any single-input, single-output, minimum phase, relative degree two or less linear system of any dimension. Controllers of this type are based on minimal dynamic compensator synthesis. While such controllers are simple in structure they do not have a model-following capability. In this paper we develop a new algorithm based on observer theory, which can adaptively stabilize and achieve model-following as well. The controller, which is a smooth nonlinear dynamical system of dimension 4(n+1), can adaptively stabilize any physical process with scalar input u and scalar output y, provided the process can be modelled by a strictly-proper, minimum phase, linear system of dimension not exceeding n and relative degree not exceeding two.

DESCRIPTORS: (U) \*MATHEMATICAL MODELS, \*ADAPTIVE CONTROL SYSTEMS, LINEAR SYSTEMS, OUTPUT, SCALAR FUNCTIONS, SIZES(DIMENSIONS), COMPENSATORS, DYNAMICS, SYNTHESIS, PHYSICAL PROPERTIES, NONLINEAR SYSTEMS, ALGORITHMS, STABILIZATION

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A1

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 807

7/1 20/3

CORNELL UNIV ITHACA NY BAKER LAB

(U) Thin Film Synthesis of Superconducting Chemical Compounds.

DESCRIPTIVE NOTE: Final rept. 1 Jan 84-14 Oct 85,

NOV 85 12P

PERSONAL AUTHORS: Hoffmann, Roald ; Sienko, M. J. ;

CONTRACT NO. AFOSR-83-0271

PROJECT NO. 2917

TASK NO. A3

MONITOR: AFOSR  
TR-85-1104

UNCLASSIFIED REPORT

ABSTRACT: (U) The effect on crystallographic parameters of selenium for sulfur replacement has been studied in several series of ternary molybdenum chalcogenides of the Chevrel-Phase type. The magnetic and superconducting properties of these ternaries was investigated.

DESCRIPTORS: (U) SYNTHESIS(CHEMISTRY), \*CHALCOGENS, \*MOLYBDENUM COMPOUNDS, \*SUPERCONDUCTORS, SUPERCONDUCTIVITY, CRYSTALLOGRAPHY, SELENIUM, SULFUR, REPLACEMENT, TERNARY COMPOUNDS, THIN FILMS, MAGNETIC PROPERTIES, COILS

IDENTIFIERS: (U) PE81102F, WUAFOSR2917A3

AD-A162 807

UNCLASSIFIED

AD-A162 806 12/1

MASSACHUSETTS INST OF TECH CAMBRIDGE LAB FOR INFORMATION AND DECISION SYSTEMS

(U) An Algebraic Approach to Time Scale Analysis and Control.

DESCRIPTIVE NOTE: Doctoral thesis.

OCT 85 225P

PERSONAL AUTHORS: Lou, Xi-Cheng ;

REPORT NO. LIDS-TH-1505

CONTRACT NO. DAAG29-84-K-0005, AFOSR-82-0258

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-85-1129

UNCLASSIFIED REPORT

ABSTRACT: (U) An algebraic approach is developed for multiple time scale decomposition of a linear system using the Smith structure of the system matrix viewed as the matrix of functions of a small parameter  $\epsilon$ . This derivation makes clear that both the necessary and sufficient multiple semi-stability (MSST) condition, which ensures well-defined multiple time scale behavior and the time-scale-decomposed system structure which approximates the original system are closely related to the so-called Schur complements of a certain matrix. Furthermore, this decomposition has been extended to a larger class of systems, satisfying the so-called multiple semi-simple nullstructure (MSSNS) condition. The algebraic approach is also applied to examine the questions of the feedback control of the linear systems. Specifically this document presents results on time scale modifications by state feedback. Keywords: Trises eigenvalues; perturbations.

DESCRIPTORS: (U) \*LINEAR SYSTEMS, ALGEBRA, CONTROL, FEEDBACK, PARAMETERS, EIGENVALUES, THESES, MODIFICATION, SCALE, TIME, DECOMPOSITION, PERTURBATIONS

AD-A162 806

PAGE 50 EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 806 CONTINUED

AD-A162 804 20/8 7/4

IDENTIFIERS: (U) Time scale analysis, PE81102F,  
WUAFOSR2304A1

NATIONAL BUREAU OF STANDARDS GAITHERSBURG MD CENTER FOR  
CHEMICAL PHYSICS

(U) Vibrational Energy Relaxation of Adsorbates on  
Surfaces,

85 6P

PERSONAL AUTHORS: Hellwell, E. J. ; Casassa, M. P. ; Cavanagh,  
R. R. ; Stephenson, J. C. ;

CONTRACT NO. AFOSR-ISSA-85-00004

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR  
TR-85-1143

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in SPIE Ultrashort Pulse  
Spectroscopy and Applications, V533 p15-19 1985.

ABSTRACT: (U) Picosecond infrared transient bleaching  
experiments have been performed to measure the population  
lifetime (T sub 1) of vibrationally excited (ν=1)  
functional groups chemisorbed on high surface area  
colloidal silicas (SiO2). The experimental method and  
results for vibrational modes of -OH, -OD, -NH2 and -OCH3  
coordinated to surface silicon atoms and for the -BOH  
surface species are presented. Lifetimes for these groups  
at both vacuum and liquid interfaces indicate that the  
adsorbate degrees of freedom, chemical coordination and  
nearby substrate modes play an important role in damping  
vibrational energy. It is also surmised that the  
vibrational lifetime, especially that for the hydroxyl  
group (T sub 1 = 150 ps), is related to the chemical  
reactivity of adsorbates on surfaces. (Reprints)

DESCRIPTORS: (U) \*RELAXATION, \*ADSORBATES, \*MOLECULAR  
VIBRATION, ATOMS, CHEMICAL REACTIONS, DAMPING, ENERGY,  
HYDROXYL RADICALS, INTERFACES, LIQUIDS, SURFACE CHEMISTRY,  
SILICON DIOXIDE, REACTIVITIES, REPRINTS, SILICON,  
SURFACES, VACUUM, VIBRATION

IDENTIFIERS: (U) PE81102F, WUAFOSR2303A2

AD-A162 806

AD-A162 804

UNCLASSIFIED

PAGE 51 EVK551

UNCLASSIFIED

OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551  
AD-A162 803 CONTINUED

AD-A162 803 7/4 20/8

NATIONAL BUREAU OF STANDARDS GAITHERSBURG MD CENTER FOR  
CHEMICAL PHYSICS

(U) Vibrational Deactivation of Surface OH Chemisorbed on  
SiO sub 2: Solvent Effects.

JUN 85 17P

PERSONAL AUTHORS: Hellwell, E. J. ; Casassa, M. P. ; Cavanagh,  
R. R. ; Stephenson, J. C. ;

CONTRACT NO. AFOSR-ISSA-85-00004

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR  
TR-85-1142

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v82  
n11 p5218-5231, 1 Jun 85.

ABSTRACT: (U) Picosecond infrared transmission spectroscopy was used to directly measure the vibrational energy relaxation time T sub 1 of hydroxyl groups chemisorbed on the surface of colloidal silica (SiO2). T sub 1 was obtained for OH(v stretch = 1) in the strongly bound isolated sites of fumed silica particles in vacuum interface, T sub 1 = 204 + or - 20 ps. When the SiO2 particles are surrounded by solvents, the relaxation time of the surface OH(v = 1) groups decreases: for the liquids CCl4, CF2Br2, CH2Cl2, and C6H6, T sub 1(ps) = 159 + or - 16, 140 + or - 30, 102 + or - 20, and 87 + or - 30, respectively. T sub 1 does not depend on the size of the SiO2 particles for the range 70 A < or = diameter < or = 150 A, or on the surface OH coverage up to an average density of 4 OH/100 sq A. Significant amounts of physisorbed water (5 H2O/100 sq A) decreased T sub 1 for the isolated OH(v = 1) to T sub 1 = 56 + or - 10 ps. For comparison to the surface hydroxyls, the vibrational deactivation time for OH(v = 1) groups in the bulk of fused silica (OH/SiO2 approx. 130 ppm by weight) was determined to be T sub 1 = 109 + or - 11 ps. These observations are discussed in terms of the possible mechanisms of vibrational energy flow in these systems.

AD-A162 803

AD-A162 803

UNCLASSIFIED

PAGE 52

EVK551

DESCRIPTORS: (U) \*MOLECULAR VIBRATION, \*HYDROXYL RADICALS, \*CHEMISORPTION, RELAXATION TIME, \*SURFACE CHEMISTRY, FUSED SILICA, PARTICLES, SILICON DIOXIDE, SOLVENTS, COLLOIDS, SILICON DIOXIDE, SURFACES, INTERFACES, VACUUM, INFRARED SPECTROSCOPY, SOLVENTS, VIBRATION, DEACTIVATION, SURFACES, WATER, ENERGY TRANSFER, REPRINTS

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A2

The observed T sub 1 values demonstrate that the spectral linewidths (e.g., IR and Raman) observed for these surface vibrations are too large (by factors of 200-2000) to be caused solely by T sub 1 uncertainty broadening. The slow transfer of vibrational energy between surface and lattice vibrations may have important implications for surface chemistry.



## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

## SEARCH CONTROL NO. EVK551

AD-A182 800 12/1

AD-A162 797 7/4 20/8

NORTH CAROLINA UNIV AT CHAPEL HILL CENTER FOR STOCHASTIC PROCESSES

NATIONAL BUREAU OF STANDARDS GAITHERSBURG MD CENTER FOR CHEMICAL PHYSICS

(U) Invariance Principles Under a Two-Part Mixing Assumption.

(U) Picosecond Vibrational Energy Relaxation of Surface Hydroxyl Groups on Colloidal Silica.

DESCRIPTIVE NOTE: Technical rept..

SEP 84 4P

OCT 85 45P

PERSONAL AUTHORS: Hellwell, Casassa ; Cavanagh, Stephenson ;

PERSONAL AUTHORS: Bradley, Richard C. ; Peligrad, Magda ;

CONTRACT NO. AFOSR-ISSA-85-00004

REPORT NO. TR-122

PROJECT NO. 2303

CONTRACT NO. F49620-85-C-0144, NSF-DMS84-01021

TASK NO. A2

PROJECT NO. 2304

MONITOR: AFOSR TR-85-1139

TASK NO. A5

UNCLASSIFIED REPORT

MONITOR: AFOSR

TR-85-1106

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Sponsored in part by Grant DMS85-03016.

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v81 n6 p2856-2858, 15 Sep 84.

ABSTRACT: (U) In this document weak and strong invariance principles are established for strictly stationary sequences satisfying a mixing assumption which has two parts, one based on the strong mixing condition with a polynomial mixing rate and the other based on the  $\alpha$ -mixing condition. Keywords: Random variables; Theorems; hypotheses. (Author)

ABSTRACT: (U) Time resolved measurements of picosecond vibrational population decay of chemisorbed species on high surface area colloidal silica at room temperature have been performed. The influence of solvent on OH relaxation and the variation in observed relaxation rates are discussed in terms of the vibrational level structure and surface coordination of each adsorbate. (Author)

DESCRIPTORS: (U) \*INVARIANCE, HYPOTHESES, MIXING, POLYNOMIALS, RANDOM VARIABLES, RATES, STATIONARY, THEOREMS, SEQUENCES (MATHEMATICS)

DESCRIPTORS: (U) \*MOLECULAR VIBRATION, \*SURFACE CHEMISTRY, \*SILICON DIOXIDE, \*HYDROXYL RADICALS, VIBRATIONAL SPECTRA, CHEMISORPTION, ENERGY LEVELS, COLLOIDS, DECAY, SURFACES, VIBRATION, SOLVENTS, ROOM TEMPERATURE, ENERGY, RELAXATION, INFRARED SPECTROSCOPY, GROUND STATE, REPRINTS

IDENTIFIERS: (U) WJAFOSR2304A5, PE81102F

IDENTIFIERS: (U) PE81102F, WJAFOSR2303A2

AD-A162 800

AD-A162 797

## UNCLASSIFIED

PAGE 53

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 796 9/4 12/1

PITTSBURGH UNIV PA CENTER FOR MULTIVARIATE ANALYSIS

(U) Effects of Estimated Noise Covariance Matrix in  
Optimal Signal Detection.

DESCRIPTIVE NOTE: Technical rept..

OCT 85 26P

PERSONAL AUTHORS: Khatri, C. G. ; Rao, C. R. ;

REPORT NO TR-85-38

CONTRACT NO. F49620-85-C-0008

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-85-1130

UNCLASSIFIED REPORT

ABSTRACT: (U) There is loss of efficiency when an estimated noise covariance matrix is used in the place of the unknown true noise covariance matrix in the construction of the optimum filter for signal detection. In the case of detecting a single signal specified by a real or a complex vector, we investigate the extent of this loss by obtaining an exact confidence bound for the realized signal to noise ratio. We also give an estimate of this ratio which is useful in optimum selection of features. Some of these results are extended to the case of discrimination between a number of given signals.  
(Author)

DESCRIPTORS: (U) \*CONFIDENCE LEVEL, \*FILTERS, \*SIGNAL TO NOISE RATIO, \*ESTIMATES, \*DETECTION, EFFICIENCY, LOSSES, OPTIMIZATION, RATIOS, NOISE, SIGNALS, SELECTION

IDENTIFIERS: (U) PE81102F, WJAFOSR2304A5

AD-A162 796

UNCLASSIFIED

AD-A162 795 9/3

YALE UNIV NEW HAVEN CT CENTER FOR SYSTEMS SCIENCE

(U) Adaptive Control of Multivariable Systems.

DESCRIPTIVE NOTE: Interim rept. 15 Jul 84-14 Jul 85,

OCT 85 5P

PERSONAL AUTHORS: Morse, A. S. ;

CONTRACT NO. AFOSR-84-0242

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-85-1113

UNCLASSIFIED REPORT

ABSTRACT: (U) During this period the Principal Investigator wrote six technical papers. Titles are: New directions in parameter adaptive control, Adaptive stabilization of linear systems with unknown high frequency, A smooth algorithm for adaptive stabilization of a discrete linear system with an unknown high frequency gain, A  $4(n+1)$ -dimensional model reference adaptive control for the stabilization of any strictly proper minimum phase linear system with relative degree not exceeding two and dimension not exceeding  $n$ , Adaptive stabilization of a discrete linear system with an unknown high frequency gain, and A three dimensional universal controller for the adaptive stabilization of any strictly proper minimum-phase system with relative degree not exceeding two.  
(Author)

DESCRIPTORS: (U) \*ADAPTIVE CONTROL SYSTEMS, LINEAR SYSTEMS, HIGH FREQUENCY, MULTIVARIATE ANALYSIS, ALGORITHMS, STABILIZATION, FREQUENCY, GAIN, HIGH FREQUENCY, HIGH GAIN, STABILIZATION

IDENTIFIERS: (U) WJAFOSR2304A1, PE81102F

AD-A162 795

PAGE 54 EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 779

12/1

AD-A162 776 12/1 6/5

NORTH CAROLINA UNIV AT CHAPEL HILL DEPT OF STATISTICS

(U) M-Estimation for Discrete Data. Asymptotic Distribution Theory and Implications.

DESCRIPTIVE NOTE: Technical rept..

OCT 85 22P

PERSONAL AUTHORS: Simpson, Douglas G. ; Carroll, Raymond J. ; Ruppert, David ;

CONTRACT NO. F49620-85-C-0144, NSF-DMS84-00602

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-85-1115

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Prepared in cooperation with Illinois Univ., Urbana. Dept. of Statistics.

ABSTRACT: (U) The asymptotic distribution of an M-estimator is studied when the underlying distribution is discrete. Asymptotic normality is shown to hold quite generally within the assumed parametric family. When the specification of the model is inexact, however, it is demonstrated that an M-estimator with a non-smooth score function, e.g., a Huber estimator, has a non-normal limiting distribution at certain distributions, resulting in unstable inference in the neighborhood of such distributions. Consequently, smooth score functions are proposed for discrete data. Keywords: Robust estimation; and Discrete parametric models. (Author)

DESCRIPTORS: (U) \*DISCRETE DISTRIBUTION, \*ASYMPTOTIC NORMALITY, MATHEMATICAL MODELS, ESTIMATES, ABNORMALITIES, LIMITATIONS, PARAMETRIC ANALYSIS, ASYMPTOTIC SERIES

IDENTIFIERS: (U) \*M estimation, Robustness, PE81102F, WJAFOSR2304A5

AD-A162 779

UNCLASSIFIED

SEARCH CONTROL NO. EVK551

MASSACHUSETTS INST OF TECH CAMBRIDGE LAB FOR INFORMATION AND DECISION SYSTEMS

(U) A Markov Chain Approach to Electrocardiogram Modeling and Analysis.

DESCRIPTIVE NOTE: Technical rept..

APR 85 404P

PERSONAL AUTHORS: Doerschuk, Peter C. ;

REPORT NO. LIDS-TH-1452

CONTRACT NO. AFOSR-82-0258

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-85-1127

UNCLASSIFIED REPORT

ABSTRACT: (U) A novel class of models of the electrocardiogram using interacting Markov chains is developed and used as a basis for signal processing. The modeling methodology emphasizes a balance between the inclusion of physiological detail and practicality for signal processing. In order for signal processing algorithms based on the model to achieve accurate, detailed classification of the electrocardiogram, it is necessary to include physiological detail in the model. On the other hand, in order to make the signal processing practical, the models are restricted by imposing spatial, temporal, and hierarchical decompositions. A signal processing algorithm for a wave tracking problem relevant to rhythm classification is proposed. The algorithm is decomposed to mirror the spatial decomposition of the model. On the other hand, in order to make the signal processing practical, the models are restricted by imposing spatial, temporal, and hierarchical decompositions. A signal processing algorithm for a wave tracking problem relevant to rhythm classification is proposed. The algorithm for a wave tracking problem is relevant to rhythm classification is proposed. The algorithm for a wave tracking problem relevant to

AD-A162 776

PAGE 55 EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 776 CONTINUED

AD-A162 773 12/1

rhythm classification is proposed. The algorithm for a wave tracking problem relevant to rhythm classification is proposed. The algorithm is decomposed to mirror the spatial decomposition of the model. Limited simulations indicate that reasonable performance may be attainable.

DESCRIPTORS: (U) \*MATHEMATICAL MODELS,  
\*ELECTROCARDIOGRAPHY, \*MARKOV PROCESSES, COMPUTERIZED  
SIMULATION, PHYSIOLOGY, ALGORITHMS, CLASSIFICATION,  
DECOMPOSITION, LIMITATIONS, SIMULATION, BIOLOGICAL  
RHYTHMS, SIGNAL PROCESSING, INTERACTIONS, DECOMPOSITION,  
SPATIAL DISTRIBUTION, TRACKING, WAVES, THESES, MODELS

IDENTIFIERS: (U) PE81102F, WJAFOSR2304A1

MASSACHUSETTS INST OF TECH CAMBRIDGE LAB FOR INFORMATION  
AND DECISION SYSTEMS

(U) The Reduction of Perturbed Markov Generators: An  
Algorithm Exposing the Role of Transient States.

DESCRIPTIVE NOTE: Technical rept.,

SEP 85 54P

PERSONAL AUTHORS: Rohlicek, Jan R. ; Willsky, Alan S. ;

REPORT NO. LIDS-P-1493

CONTRACT NO. AFOSR-82-0258

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-85-1119

UNCLASSIFIED REPORT

ABSTRACT: (U) A new algorithm for the hierarchical aggregation of singularly perturbed finite-state Markov processes is derived. The approach taken bridges the gap between conceptually simple results for a relatively restricted class of processes and the significantly more complex results for the general case. The critical role played by (almost) transient states is exposed resulting in a straightforward algorithm for the construction of a sequence of aggregate generators associated with various time scales. These generators together provide a uniform asymptotic approximation of the original probability transition function. (Author)

DESCRIPTORS: (U) \*MARKOV PROCESSES, \*ALGORITHMS,  
PERTURBATIONS, SEQUENCES(MATHEMATICS), SCALE, TIME,  
PROBABILITY DISTRIBUTION FUNCTIONS, TRANSITIONS,  
APPROXIMATION(MATHEMATICS), ASYMPTOTIC SERIES

IDENTIFIERS: (U) \*Markov generators, PE81102F,  
WJAFOSR2304A1

AD-A162 776

AD-A162 773

UNCLASSIFIED

PAGE 56

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 772

7/4

PENNSYLVANIA STATE UNIV UNIVERSITY PARK MATERIALS  
RESEARCH LAB

(U) Investigations into the Origins of the Physical  
Structure of Thin Films.

DESCRIPTIVE NOTE: Annual rept. 1 Jul 84-30 Jun 85.

OCT 85

42P

PERSONAL AUTHORS: Messier, Russell ;

CONTRACT NO. AFOSR-84-0149

PROJECT NO. 2308

TASK NO. B2

MONITOR: AFOSR  
TR-85-1105

UNCLASSIFIED REPORT

ABSTRACT: (U) The random ballistic aggregation of atoms onto a surface under low adatom mobility conditions leads to clustering and evolution of growth cones from these random clusters. The connections between these basic physical processes and the resulting wide variety of thin film morphologies (both top surface and cross-section) are being made in an attempt to quantify morphology, and ultimately properties. The research can be divided into four research thrust areas: 1. controlled film preparation; 2. morphological characterization of the resulting films; 3. image enhancement/quantification of micrographs of morphology; and 4. conceptual and computer modeling of the morphology. This report describes our progress in each of these areas. Originators supplied keywords include: Sputtering; Ion-assisted deposition; and Fractals.

DESCRIPTORS: (U) \*MORPHOLOGY, \*THIN FILMS, CONTROL, DEPOSITION, IONS, STRUCTURAL PROPERTIES, SPUTTERING, COMPUTERIZED SIMULATION, CONICAL BODIES, GROWTH(GENERAL), IMAGE PROCESSING, OPTIMIZATION, ADATOMS, CLUSTERING, ION BOMBARDMENT

IDENTIFIERS: (U) PE81102F, WJAFOSR2308B2

AD-A162 772

UNCLASSIFIED

AD-A162 770

20/11

UNITED TECHNOLOGIES RESEARCH CENTER EAST HARTFORD CT

(U) Study of Characteristics of Dry Friction Damping.

DESCRIPTIVE NOTE: Annual technical rept. 1 Mar 83-1 Mar 84,

MAR 84

45P

PERSONAL AUTHORS: Srinivasan, A. V. ; Cassenti, B. N. ; Cutts, D. G. ;

REPORT NO. UTRC/R84-856479-1

CONTRACT NO. F49620-83-C-0078

PROJECT NO. 2307

TASK NO. B1

MONITOR: AFOSR  
TR-85-1074

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Presented at the Air Force Vibration Damping Workshop Held at Long Beach, CA. on 27-29 Feb 84.

ABSTRACT: (U) This report pertains to the overall problem of estimating damping due to dry friction forces induced at interfaces of vibrating components. The phase of the effort reported here contains the summary of a literature survey and identifies the scope of research needed. The survey clearly indicated the complex processes involved during rubbing of one component relative to another bringing into play a host of parameters. Very limited data, especially of a fundamental nature, appears to be available in regard to dry friction in a vibratory environment. An analytical and corresponding experimental plan is presented and discussed. These plans include (a) considerations of new laws of friction appropriate to vibration analyses and (b) corresponding basic experiments from which a data base can be developed for use in design of structural components. Keywords: Aerodynamic damping.

DESCRIPTORS: (U) \*DAMPING, \*VIBRATION, FRICTION, AERODYNAMICS, INTERFACES, PARTS, STRUCTURAL MEMBERS.

AD-A162 770

PAGE 57

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A182 770 CONTINUED

ENVIRONMENTS, DATA BASES

IDENTIFIERS: (U) PE81102F, WJAFDSR230781

AD-A182 769 9/2

MICHIGAN UNIV ANN ARBOR DEPT OF ELECTRICAL ENGINEERING  
AND COMPUTER SCIENCE

(U) An Analysis and Simulation of the CRAY X-MP Memory  
System.

DESCRIPTIVE NOTE: Technical rept.,

SEP 85 8P

PERSONAL AUTHORS: Calahan, D. A. ;

CONTRACT NO. AFOSR-84-0098

PROJECT NO. 2304

TASK NO. A3

MONITOR: AFOSR  
TR-85-1117

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Presented at the International  
Conference on Supercomputing (1st) Held at Tampa, Fl. on  
18-19 Dec 85.

ABSTRACT: (U) The CRAY X-MP 2- and 4-processor memory  
systems are analyzed and simulated using an instruction-  
level timing simulation of up to 18 processors. This  
study indicates a disturbing counter-intuitive trend to  
longer delays in vector accesses as both the number of  
processors and memory banks increase proportionately.  
This delay appears to be related to access start-up  
delays, which are determined for various memory  
organizations. Keywords include: Supercomputers;  
Simulation; and Parallel processors.

DESCRIPTORS: (U) \*MEMORY DEVICES, PARALLEL PROCESSORS,  
COMPUTERIZED SIMULATION, SUPERCOMPUTERS

IDENTIFIERS: (U) PE81102F, WJAFDSR2304A3

AD-A182 770

AD-A182 769

UNCLASSIFIED

PAGE 58

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 768

17/9

UTAH STATE UNIV LOGAN CENTER FOR ATMOSPHERIC AND SPACE SCIENCES

AD-A162 768 CONTINUED

WAVELENGTHS (5-500km) IN MESOSPHERIC GRAVITY WAVES, TIDES AND WINDS -- WORKSHOP & DESIGN STUDY. (Author)

(U) Measurement of Horizontal Structures and Wavelengths (5-500 km) in Mesospheric Gravity Waves, Tides and Winds. Workshop and Design Study.

DESCRIPTORS: (U) \*INTERFEROMETERS, \*MESOSPHERE, \*MONOSTATIC RADAR, \*WIND, \*GRAVITY WAVES, \*METEORS, COLORADO, HORIZONTAL ORIENTATION, MEASUREMENT, STRUCTURES, ECHOES, RECEIVERS, PENNSYLVANIA, PULSES, TIDES, RADAR, SITES, WIND

DESCRIPTIVE NOTE: Final rept. 15 May-14 Nov 84,

AUG 85 14P

IDENTIFIERS: (U) PEB1102F, WUAFOSR2310A2

PERSONAL AUTHORS: Adams, Gene W. ;

CONTRACT NO. AFOSR-84-0121

PROJECT NO. 2310

TASK NO. A2

MONITOR: AFOSR  
TR-85-0998

#### UNCLASSIFIED REPORT

ABSTRACT: (U) It is well known that monostatic radars are poor meteor-wind radars. It has been suggested, however, that an outboard receiving site, configured as an interferometer, could receive pulses scattered by meteor trails from the ST's beams, resolve the geometry, and thus measure winds in the 80 - 110 km region. This approach, dubbed MENTOR (Meteor Echoes; No Transmitter, Only Receivers), would be an inexpensive way to add mesospheric capabilities to ST radars. The cost of a MENTOR receiver system is expected to be a small fraction of the cost of either a meteor-wind system or an ST radar. In addition, locations such as Colorado and Pennsylvania that have networks of ST radars could use a single MENTOR receiving site to determine winds above all ST radars within a several hundred kilometer radius. This could make possible the measurement of gravity-wave phenomena over much larger horizontal distances that can be accomplished from a single site. A MENTOR workshop was held 21 May 1984. It was concluded that the MENTOR approach in Colorado (or anyplace else with a network of MST radars) would yield important new information about winds in the mesosphere and about mesospheric gravity waves with horizontal scales of 50-500km. Final report, AFOSR-84-0121, MEASUREMENT OF HORIZONTAL STRUCTURES AND

AD-A162 768

AD-A162 768

UNCLASSIFIED

PAGE 59

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 767 CONTINUED

AD-A162 767 19/4 19/1 21/9.2 21/8.2

ILLINOIS UNIV AT URBANA DEPT OF MECHANICAL AND INDUSTRIAL  
ENGINEERING

(U) Prediction of Detonation Transition in Porous  
Explosives from Rapid Compression Loadings.

DESCRIPTIVE NOTE: Final rept. 30 Aug 83-10 Sep 85.

SEP 85 89P

PERSONAL AUTHORS: Krier, Herman ; Stewart, James R. ;

REPORT NO. UILU-ENG-85-4007

CONTRACT NO. AFOSR-81-C145

PROJECT NO. 2301

TASK NO. A8

MONITOR: AFOSR  
TR-85-1134

UNCLASSIFIED REPORT

ABSTRACT: (U) Increasing the nitramine content of solid rocket propellants increases the overall performance of the system as well as the sensitivity to shock to Detonation Transition (SDT) and Deflagration to Detonation Transition (DDT). This report deals primarily with the analysis and numerical modeling of a combined SDT/DDT event. The results show that in some instances a zone of burning granulated propellant, confined and adjacent to a zone of cast propellant, can provide a rapid enough pressure-rise rate to shock initiate the cast material. This type of detonation hazard scenario is a real possibility in any high-energy rocket motor environment. The modeling study also indicates areas where important assumptions need to be further researched. These include: (a) relations for dynamic (transient) collapse of the voids or pores; (b) relations for setting the volume percent of hot spots based on initial porosity; (c) the evaluation and expression for the chemical rate of decomposition of the reactive, shocked material; and (d) the assessment of two-phase mixture equilibrium. The predicted run-to detonation distance as a function of porosity for HMX explosive compares favorably with limited shock initiation experiments. There is no data

AD-A162 767

AD-A162 787

UNCLASSIFIED

PAGE 60

EVK551



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 766

11/8

7/4

VIRGINIA UNIV CHARLOTTESVILLE DEPT OF MATERIALS SCIENCE

(U) Study of Transport Properties and Structure of  
Extended-Chain Polymers: Diffusion and Solubility of  
Gases.

DESCRIPTIVE NOTE: Interim rept. 1 Oct 81-30 Sep 82.

SEP 85

170P

PERSONAL AUTHORS: Barker, R. Edward, Jr.; Huang, W. S. ;

REPORT NO. UVA/S25831/MS88/101

CONTRACT NO. AFOSR-80-0014

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-85-1110

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also AD-A162 785.

ABSTRACT: (U) The study of the transport properties in extended chain polymers has added to the understanding of relations between their macroscopic and microscopic properties. There was a need to determine the extent to which a new class of high strength extended chain polymers absorb various vapors and how the vapor moves within the materials, which have a highly anisotropic fibrous morphology. The main polymer studied as a representative of the class is poly p-phenylene benzobisthiazole (PPBT). An abnormally large heat of sorption (solution) and paradoxical data from two experimental systems with somewhat different conditions are attributed to a large volume fraction of microcavities in PPBT. This hypothesis was shown to be consistent by using the theory of dual sorption. A statistical mechanical model due to diBenedetto was modified to correlate the activation energy with rotation energy and to make possible the prediction of the parallel diffusion coefficient.

DESCRIPTORS: (U) \*MOLECULAR STRUCTURE, \*DIFFUSION,

AD-A162 766

AD-A162 766

UNCLASSIFIED

PAGE 81

EVK551

AD-A162 766

CONTINUED

\*POLYMERS, \*SOLUBILITY, POLYPHENYLENES, BENZENE, THIAZOLES, ACTIVATION ENERGY, HYPOTHESES, ENERGY, ROTATION, MATHEMATICAL MODELS, STATISTICAL ANALYSIS, STATISTICAL MECHANICS, SORPTION, ANISOTROPY, FIBERS, MORPHOLOGY, HIGH STRENGTH, DIFFUSION COEFFICIENT, GASES, TRANSPORT PROPERTIES, THEORY, VAPORS, PERMEABILITY, DESORPTION

IDENTIFIERS: (U) PPBT(Thiazole/Poly-p-Phenylene Benzobis) , PEB1102F, WUAFOSR2303A3

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 765 11/9 7/4

AD-A162 765 CONTINUED

VIRGINIA UNIV CHARLOTTESVILLE DEPT OF MATERIALS SCIENCE

(U) Study of Transport Properties and Structure of  
Extended-Chain Polymers.

DESCRIPTIVE NOTE: Final rept. 1 Oct 79-31 Mar 83,

SEP 85 283P

PERSONAL AUTHORS: Barker, R. Edward, Jr.; Lawless, Kenneth  
R.; Chen, Daniel Y.;

REPORT NO. UVA/525831/MS88/103

CONTRACT NO. AFOSR-80-0014

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-85-1111

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: See also AD-A162 766.

ABSTRACT: (U) The broad objective of the work was to relate charge, heat, and mass transport in the Air Force's extended chain polymers (especially poly-para-phenylene benzobisthiazole PBT) to other electrical, thermal, mechanical and microstructural properties of the polymers and also to compare these very unusual, highly anisotropic Air Force materials with other materials when it is scientifically relevant or when potential applications may be involved. Special techniques were developed for making transport-property determinations on samples in the form of thin fibers and small area films. Two types of miniature cells were developed in the study of PBT transport properties. A very promising area of the research relates to an anisotropic version of the Barker-Sharbaugh weak electrolyte model for ionic conduction in polymers. A new technique which has been termed the diffusion controlled-differential current (DDC) method evolved from experiments related to the weak electrolyte model. This DDC-technique looks promising as a new analytical tool. The results for PBT turned out to be especially interesting because the ratio of ionic

AD-A162 765

AD-A162 765

UNCLASSIFIED

PAGE 62

EVK551

conductivities parallel and perpendicular to the chain axis was very large (100,000 at 300 K) and temperature dependent (smaller ratio at a higher temperature). Special techniques for the thermal conductivity allowed the axial and perpendicular thermal conductivities to be determined.

DESCRIPTORS: (U) \*POLYMERS, \*TRANSPORT PROPERTIES, MOLECULAR STRUCTURE, DIFFUSION, POLYPHENYLENES, BENZENE, THIAZOLES, ANISOTROPY, IONIC CURRENT, MICROSTRUCTURE, THERMAL CONDUCTIVITY, VERTICAL ORIENTATION, FILMS, AXES, TEMPERATURE, MASS TRANSFER, CELLS, MINIATURIZATION, RATIOS, FIBERS, THINNESS, ELECTROLYTES, LOW STRENGTH, MODELS, SORPTION, DESORPTION

IDENTIFIERS: (U) PBT(Thiazole/Poly-Para-Phenylene Benzobis), PE81102E, WUAF0SR2303A3

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A182 758

6/5

MASSACHUSETTS INST OF TECH CAMBRIDGE LAB FOR INFORMATION  
AND DECISION SYSTEMS

(U) Modeling Electrocardiograms Using Interacting Markov  
Chains.

DESCRIPTIVE NOTE: Technical rept.,

JUL 85 84P

PERSONAL AUTHORS: Doerschuk, Peter C. ; Tenney, Robert R. ;  
Wjilsky, Alan S. ;

REPORT NO. LIDS-P-1491

CONTRACT NO. AFOSR-82-0258

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-85-1118

UNCLASSIFIED REPORT

ABSTRACT: (U) In this paper we develop a methodology for the statistical modeling of cardiac behavior and electrocardiograms (ECG's) that emphasizes a) the physiological event/detailed waveform hierarchy; and b) the importance of control and timing in describing the interactions among the several anatomical subunits of the heart. This methodology has been motivated by a desire to develop improved algorithms for statistical rhythm analysis that capture cardiac behavior in a more fundamental way but that stops short of complete accuracy in order to highlight decompositions that can be exploited to simplify statistical inference based on these models. Our models consist of interacting finite-state processes, where a very few of the transition probabilities for each process can take on a small number of different values depending upon the states of neighboring processes. Each finite-state process is constructed from a very small set of elementary structural elements. We illustrate our methodology by describing models for three cardiac rhythms and include simulation results for one of these, namely the rhythm known as Wenckebach.

AD-A182 758

AD-A182 758

UNCLASSIFIED

PAGE 63

EVK551

DESCRIPTORS: (U) \*ELECTROCARDIOGRAPHY, \*MATHEMATICAL  
MODELS, ACCURACY, BIOLOGICAL RHYTHMS, HEART, HIERARCHIES,  
INTERACTIONS, MARKOV PROCESSES, BIOLOGICAL RHYTHMS,  
SIMULATION, STATISTICAL ANALYSIS, STATISTICAL INFERENCE,  
WAVEFORMS

IDENTIFIERS: (U) PEG1102F, WJAFOSR23041

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

## SEARCH CONTROL NO. EVK551

AD-A162 757

9/2

AD-A162 754

4/1

17/9

FLORIDA STATE UNIV TALLAHASSEE DEPT OF STATISTICS

JOHNS HOPKINS UNIV LAUREL MD DEPT OF SPACE

(U) Fault Diversity in Software Reliability.

(U) High Frequency Radar Studies of the Very High Latitude Ionosphere.

DESCRIPTIVE NOTE: Technical rept..

DESCRIPTIVE NOTE: Final rept. 15 Feb 83-30 Sep 85,

SEP 85

24P

SEP 85

57P

PERSONAL AUTHORS: Boland, Philip J.; Proschan, Frank; Tong, Y. L.;

PERSONAL AUTHORS: Greenwald, Raymond A.;

REPORT NO. FSU-STATISTICS-M714, TR-85-185

CONTRACT NO. AFOSR-ISSA-85-00084, AFOSR-ISSA-84-00042

CONTRACT NO. F49620-85-C-0007, NSF-DMS85-02346

PROJECT NO. 2304

TASK NO. A5

TASK NO. A2

MONITOR: AFOSR

MONITOR: AFOSR

TR-85-1112

TR-85-1200

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Prepared in cooperation with University Coll. Dublin (Ireland). Dept. of Mathematics and Georgia Inst. of Tech., Atlanta School of Mathematics.

ABSTRACT: (U) Diversity of bugs or faults in a software system is a factor contributing to software unreliability which has not yet been emphasized. This paper is written with the intention of demonstrating the impact of fault diversity on the time to detection of software bugs. A new discrete software reliability model based on the multinomial distribution is introduced. It is shown that for models of this type, the more diverse the fault probabilities are, the longer (stochastically) it takes to detect or eliminate any  $n$  faults, while the smaller (stochastically) will be the number of faults detected or eliminated during a given amount of time (or during a given number of inputs to the system). The impact of fault diversity is also demonstrated for the Jelinski-Moranda model. (Author)

DESCRIPTORS: (U) \*COMPUTER PROGRAM RELIABILITY, \*DEBUGGING(COMPUTERS), DETECTION, FAULTS, PROBABILITY

IDENTIFIERS: (U) PEB1102F, WUAFOSR2304A5

AD-A162 757

AD-A162 754

## UNCLASSIFIED

PAGE 64

EVK551

ABSTRACT: (U) Operation of the Goose Bay radar began on October 11, 1983. Since that time collaborative measurements have been made with both the Sondre Stromfjord and Millstone Hill incoherent scatter radars, with the HILAT satellite, and with the Air Force Geophysics Laboratory Airborne Geophysical Observatory. In addition, an extensive set of noncollaborative measurements have been obtained. From this base of observation several papers have been written and submitted for publication and several studies have been initiated but not, as yet, reached the publication stage. These efforts include an examination of high latitude F-region irregularities in the afternoon and late evening local time sectors, an attempt to use the HF radar data to study the two-dimensional structure of irregularity drifts, a detailed study of plasma conditions and irregularity characteristics in the vicinity of the dayside cleft, attempts to compare E- and F-region irregularity drifts with plasma drift measurements obtained with the Sondre Stromfjord and Millstone Hill incoherent scatter radars, and some preliminary observations of seasonal dependences in the diurnal formation of high latitude F-region irregularities. Keywords include: Radar; HF; Electron; Density; Irregularities; E- and F-regions; Ionospheric; Oscillatory; and quasistationary.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 754 CONTINUED

AD-A162 748 1/1

DESCRIPTORS: (U) \*IONOSPHERE, \*RADAR MAPPING, E REGION,  
F REGION, ELECTRON DENSITY, VARIATIONS, OSCILLATION, HIGH  
FREQUENCY, COHERENT SCATTERING, BACKSCATTERING

TEXAS TECH UNIV LUBBOCK DEPT OF MECHANICAL ENGINEERING

(U) Stochastic Non-Linear Flutter of Aeroelastic  
Structures.

IDENTIFIERS: (U) Goose Bay(Labrador), Goose Bay  
Ionospheric Data, WUAFOSR2310A2, PE81102F

DESCRIPTIVE NOTE: Annual rept. no. 1, 1 Nov 84-31 Oct 85,

OCT 85 104P

PERSONAL AUTHORS: Ibrahim, Raouf A. ;

CONTRACT NO. AFOSR-85-0008

PROJECT NO. 2302

TASK NO. B1

MONITOR: AFOSR  
TR-85-1078

UNCLASSIFIED REPORT

ABSTRACT: (U) The linear and non-linear random modal interactions of a two degree-of-freedom aeroelastic structure are examined by using the Fokker-Planck equation approach. A general differential equation describing the evolution of the response moments is derived for any moment order. For the case of linear modal interaction this differential equation is found to constitute a closed set of moment equations. The stationary response is determined for various system parameters. It is found that the linear interaction results in a suppression of one mode when the uncoupled frequencies of the structure are close to each other. For the case of nonlinear modal (known as autoparametric) interaction the differential equation of the response moments forms an infinite coupled set of equations which are closed via two closure schemes. These are the Gaussian and non-Gaussian closure leads to 69 differential equations in the first four orders of response moments. The two sets are solved by numerical integration. Keywords: Equations of motion; Coefficients.

DESCRIPTORS: (U) \*AIRFRAMES, \*AEROELASTICITY, \*FLUTTER,  
DIFFERENTIAL EQUATIONS, EQUATIONS OF MOTION, INTERACTIONS,  
LINEAR SYSTEMS, MOMENTS, RESPONSE, COEFFICIENTS, FOKKER  
PLANCK EQUATIONS, COUPLING(INTERACTION), NUMERICAL  
INTEGRATION, RESPONSE, NONLINEAR SYSTEMS, STOCHASTIC

AD-A162 754

AD-A162 748

UNCLASSIFIED

PAGE 65 EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 748 CONTINUED

AD-A162 747 7/4 20/3

PROCESSES, PARAMETERS, DEGREES OF FREEDOM, STRUCTURAL  
PROPERTIES, SUPPRESSION, CLOSURES

SAN DIEGO STATE UNIV CA DEPT OF ELECTRICAL AND COMPUTER  
ENGINEERING

(U) Electron Production, Electron Attachment, and Charge  
Recombination Process in High Pressure Gas Discharges.

DESCRIPTIVE NOTE: Annual scientific rept. 1 Aug 84-31 Jul  
85,

SEP 85 32P

PERSONAL AUTHORS: Lee, Long C. ;

CONTRACT NO. AFOSR-82-0314

PROJECT NO. 2301

TASK NO. A7

MONITOR: AFOSR  
TR-85-1132

UNCLASSIFIED REPORT

ABSTRACT: (U) The electron productions from two-photon-  
ionization of CS<sub>2</sub>, SO<sub>2</sub> and (CH<sub>3</sub>)<sub>3</sub>N at 193 nm were  
investigated and their coefficients were measured. The  
effect of space charge on the electron conduction pulse  
was observed as a function of charge density and the  
applied electric field. The electron attachment rate  
constants of H<sub>2</sub>O and C<sub>3</sub>F<sub>8</sub> in buffer gases of Ar, N<sub>2</sub>, and  
CH<sub>4</sub> were measured. The electron attachment rate constants  
for the gas mixtures of H<sub>2</sub>O-Ar, C<sub>3</sub>F<sub>8</sub>-N<sub>2</sub> and X<sub>3</sub>F<sub>8</sub>-CH<sub>4</sub>  
increase with increasing E/N. These characteristics are  
useful for the application of opening switches. The  
electron drift velocities of various gas mixtures were  
measured. Keywords: Electron production; electron  
attachment; electron diffusion; charge recombination;  
electron conduction current; temporary negative ion;  
space charge effect; plasma decay; electron leakage from  
plasma; electron attaching gas; excimer laser; parallel-  
plate drift-tube apparatus; computer modeling; carbon  
disulfide; sulfur dioxide; methyl nitride.

DESCRIPTORS: (U) \*ELECTRON TRANSPORT, \*RECOMBINATION  
REACTIONS, ELECTRON TRANSFER, LEAKAGE(ELECTRICAL),  
ELECTRICAL CONDUCTIVITY, FLUORINATED HYDROCARBONS,  
OPENING(PROCESS), SWITCHES, BUFFERS, GASES, ELECTRONS,

AD-A162 748

AD-A162 747

UNCLASSIFIED

PAGE 86

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 747 CONTINUED

ATTACHMENT, RATES, CONDUCTIVITY, PULSES, ELECTRIC FIELDS,  
CARBON DISULFIDE, COMPUTERIZED SIMULATION, ELECTRIC  
CURRENT, DRIFT, CHARGE DENSITY, HIGH PRESSURE, ANIONS,  
SPACE CHARGE, DIOXIDES, SULFUR OXIDES, EXCIMER, GASES,  
MIXTURES, METHYL RADICALS, NITRIDES, DECAY,  
PLASMAS(PHYSICS), SPACE CHARGE

AD-A162 742 20/11

RHODE ISLAND UNIV KINGSTON DEPT OF MECHANICAL  
ENGINEERING AND APPLIED MECHANICS

(U) Study of Crack Front Distribution During Crack  
Propagation Stage in High Performance Alloys.

DESCRIPTIVE NOTE: Annual rept. 15 Sep 83-14 Sep 84,

IDENTIFIERS: (U) Drift tubes

OCT 84 49P

PERSONAL AUTHORS: Ghonem, Hamouda ;

CONTRACT NO. AFOSR-83-0322

PROJECT NO. 2303

TASK NO. 82

MONITOR: AFOSR  
TR-85-1073

UNCLASSIFIED REPORT

ABSTRACT: (U) A stochastic model describing the crack evolution and scatter associated with the crack propagation process has been built on the basis of the discontinuous Markovian process. In this model the distributions of both the propagation life necessary to reach a specified crack length and the crack length at a specific number of cycles are derived in terms of constant probability crack growth curves. The significance of this model is that, by considering the crack growth curve obtained using any continuum model as being the mean growth curve, the present model is sufficient for the identification of the crack evolution and associated scatter without the necessity of performing scatter experiments. The validity of the model is established by comparing crack growth curves generated to AI 2024-T3 and AI 7075-T6 at specific loading conditions with those experimentally obtained and reported in literature. Emphasis is placed, during the development of the model, on its adherence to the physical aspects of the crack growth mechanism and the degree of agreement between theoretical results and corresponding experimental data.

DESCRIPTORS: (U) \*CRACK PROPAGATION, \*ALLOYS, CONTINUUM MECHANICS, GRAPHS, LENGTH, CYCLES, MEAN, MATHEMATICAL

AD-A162 747

AD-A162 742

UNCLASSIFIED

PAGE 67 EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 742 CONTINUED

AD-A162 727 6/13 6/1 6/6

MODELS, STOCHASTIC PROCESSES, VALIDATION

OHIO STATE UNIV COLUMBUS DEPT OF MICROBIOLOGY

IDENTIFIERS: (U) PE61102F, WUAFOSR2302B2

(U) Development and Use of Anucleated Bacterial Cells to Assay the *in vivo* Activity of Pollutants.

DESCRIPTIVE NOTE: Final rept. Apr 81-Jul 85.

JUL 85 93P

PERSONAL AUTHORS: Reeve, John N. ; Rice, Jacqueline B. ;

CONTRACT NO. AFOSR-81-0087

PROJECT NO. 2312

TASK NO. A5

MONITOR: AFOSR  
TR-85-1136

#### UNCLASSIFIED REPORT

ABSTRACT: (U) There were 2 objectives in this research project: development of an *in vivo* assay for mistranslation-inducing activity of pollutants and characterization of amino acid substitutions. The first objective proved to be the more difficult. The T7 0.3 gene product (0.3 protein) was purified by a modification of the published procedure, and used to raise rabbit antibody to this protein. A radioimmune precipitation assay was developed which could be used to estimate increased misincorporation of cysteine into 0.3 protein. A sample assay involving only counting of the radioimmune precipitate was not achieved because we were not able to obtain the 0.3 protein free of contaminating proteins in the RIP. The 2nd objective proved more fruitful. We have been able to successfully identify the cysteine substitution sites in the N-terminal 42 positions of 0.3 protein. Cleavage of 0.3 protein with trypsin to identify cysteine for arginine substitutions showed that the major sites of cysteine misincorporation were at residues other than arginine. Sequencing of (35S) cysteine-labeled 0.3 protein showed that the most frequent substitution was at residue 15 (tyrosine) and other substitutions were at positions 9 (asparagine), 12 (aspartate), 41 (alanine) and 42 (aspartate). Mistakes at these positions were unexpected and show that context greatly affects misincorporation and that

AD-A162 742

AD-A162 727

UNCLASSIFIED

PAGE 68

EVK551



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 727 CONTINUED

AD-A162 722 12/1

misreading of 2 bases in the triplet at a time occurs relatively frequently.

DESCRIPTORS: (U) \*BACTERIA, \*CELLS(BIOLOGY), \*IN VIVO ANALYSIS, \*AMINO ACIDS, \*POLLUTANTS, ALANINES, BIOASSAY, CYSTEINE, COUNTING METHODS, PROTEINS, SUBSTITUTION REACTIONS, CONTAMINATION, SITES, ANTIBODIES, PRECIPITATES, RADIOIMMUNOASSAY, RABBITS, ASSAYING, PRECIPITATION, TYROSINE, LIQUID CHROMATOGRAPHY, ELECTROPHORESIS

IDENTIFIERS: (U) WJAFOSR231A5, PE81102F, LPN-OSUAF-762592/713617

STATE UNIV OF NEW YORK AT STONY BROOK DEPT OF APPLIED MATHEMATICS AND STATISTICS

(U) Numerical Methods for Differential Equations.

DESCRIPTIVE NOTE: Annual rept. 30 Sep 84-29 Sep 85,

SEP 85 10P

PERSONAL AUTHORS: Tewarson, Reginald P. ;

CONTRACT NO. AFOSR-84-0383

PROJECT NO. 2304

TASK NO. A3

MONITOR: AFOSR  
TR-85-1120

UNCLASSIFIED REPORT

ABSTRACT: (U) Investigators have been able to develop a computer code which has turned out to be quite competitive with a well established code. The new approach implements a variable order finite difference scheme which does not require derivatives of the given function and which uses no information outside a subinterval to approximate the given system in that subinterval. Three papers have been published as a result of this effort, with the following titles. An adaptive boundary value Runge-Kutta solver for first order boundary value problems, on the solution of sparse non-linear evaluations and some applications and A quasi-Newton method with sparse triple factorization. Four additional papers are in press. Keywords: Computer code; Variable order; and Finite difference scheme.

DESCRIPTORS: (U) \*FINITE DIFFERENCE THEORY, COMPUTER PROGRAMS, DIFFERENTIAL EQUATIONS, NUMERICAL METHODS AND PROCEDURES, RUNGE KUTTA METHOD, SOLUTIONS(GENERAL), SPARSE MATRIX, BOUNDARY VALUE PROBLEMS

IDENTIFIERS: (U) PE81102F, WJAFOSR2304A3

AD-A162 727

AD-A162 722

UNCLASSIFIED

PAGE 69

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 700 7/4

AD-A162 693 7/4

NATIONAL BUREAU OF STANDARDS GAITHERSBURG MD CENTER FOR  
CHEMICAL PHYSICS

COLORADO UNIV AT BOULDER DEPT OF CHEMISTRY

(U) Temperature Dependence of the Vibrational Population  
Lifetime of OH( $v=1$ ) in Fused Silica.

(U) Nascent Product-Vibrational State Distributions of  
Thermal Ion-Molecule Reactions Determined by Infrared  
Chemiluminescence.

JUN 85 7P

85 20P

PERSONAL AUTHORS: Heilwell, Casassa ; Cavanagh, Stephenson ;

PERSONAL AUTHORS: Hamilton, Charles E. ; Leone, Stephen R. ;

CONTRACT NO. AFOSR-ISSA-85-00004

CONTRACT NO. F49620-83-C-0013

PROJECT NO. 2303

PROJECT NO. 2303

TASK NO. A2

TASK NO. B1

MONITOR: AFOSR  
TR-85-1141

MONITOR: AFOSR  
TR-85-1000

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

Pub. in Chemical Physics Letters, V117 n2 p185-190, 7 Jun 85.

SUPPLEMENTARY NOTE: Pub. in Gas-Phase Chemiluminescence and Chemiluminescence, p139-158 1985.

ABSTRACT: (U) An infrared picosecond transient bleaching technique was used to measure vibrational lifetimes (T sub 1) of hydroxyl groups in fused silica over the temperature range 100-1450 K. T sub 1 decreases from 109 to 15 ps in this range. The T sub 1 temperature dependence is compared to non-radiative relaxation theory for the decay of the OH( $v=1$ ) quantum by a multiphonon mechanism.

ABSTRACT: (U) A flowing afterglow apparatus is used to study the dynamics of ion molecule reactions by detection of vibrational states in the products with infrared chemiluminescence. A number of simple proton transfer reactions have been studied, e.g. F(-) + HX yields HF(v) + X(-) (X = Cl, Br, I). The results show distinct differences from the analogous neutral reactions, F + HX yields HF(v) + X, which are attributed to the long range attractive forces present in the ion reactions. The reaction of N(+) + O2 is studied and discussed with respect to atmospheric implications. Other reactions of polyatomic molecules have been studied to test whether the products are formed in a direct fashion or through a long lived collision intermediate. The reaction, H + SF8(-) yields HF(v) + SF5(-), is found to have a high degree of vibrational excitation, indicative of an early attractive energy release followed by a strong repulsive release. Associative detachment processes, F(-) + H, D yields HF(v), DF(v) + e, take place via the interaction of the negative ion HF potential curve and the neutral HF surface and produce exceptionally high amounts of vibrational excitation. The results are compared to successful theoretical models of Gouyacq, in which the electron is released by dynamically-induced transitions

DESCRIPTORS: (U) \*MOLECULAR VIBRATION, \*FUSED SILICA, \*HYDROXYL RADICALS, DECAY, VIBRATIONAL SPECTRA, HIGH TEMPERATURE, QUANTUM THEORY, VIBRATION, RELAXATION, THEORY, PHONONS, TEMPERATURE, RELAXATION TIME, COLLOIDS, COVALENT BONDS, CRYSTAL LATTICES, REPRINTS

IDENTIFIERS: (U) WJAFOSR2303A2, PE81102F

AD-A162 700

AD-A162 693

UNCLASSIFIED

PAGE 70 EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 693 CONTINUED

AD-A162 692 20/8

on the outer region of the potential upon the initial reagent approach. (Reprints)

DESCRIPTORS: (U) \*AFTERGLOWS, \*CHEMILUMINESCENCE, \*INFRARED RADIATION, MOLECULAR VIBRATION, DETECTION, ELECTRONS, POLYATOMIC MOLECULES, PROTON REACTIONS, CHEMICAL REACTIONS, ENERGY TRANSFER, MOLECULES, EXCITATION, IONS, THERMAL PROPERTIES, REPRINTS

IDENTIFIERS: (U) Ion molecule interactions, WJAFOSR230381, PE81102F

OKLAHOMA STATE UNIV STILLWATER DEPT OF CHEMISTRY  
(U) Semiclassical Wave Packet Studies of Elastic and Inelastic Atom-Surface Scattering from a 3D Model Surface,

AUG 85 13P

PERSONAL AUTHORS: Smith, Charles B. ; Raff, Lionel M. ;

CONTRACT NO. AFOSR-82-0311

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR  
TR-85-1031

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v83  
n3 p1411-1420, 1 Aug 85.

ABSTRACT: (U) The semiclassical wave packet method for the investigation of elastic and inelastic gas-surface scattering is extended to the calculation of diffraction patterns and Debye-Waller factors for scattering from a three-dimensional surface. Application of the method for a model three dimensional surface yields energy transfer coefficients in good accord with our previous 2D semiclassical results and with the experimental molecular beam data. The calculate final-state momentum and energy distributions are highly structured and show that inelastic effects dominate the scattering process at high surface temperatures. At T sub s = 300K, the scattering is found to be more nearly elastic. The structural features of the distributions are shown to be correlated with the power spectrum for the lattice motion. Diffraction scattering is evident even at T sub s = 1500 K. At T sub s = 300 K, the diffraction is much more pronounced due to the increased elasticity of the collision and a larger Debye-Waller factor. The positions of the calculated diffraction peaks are found to be in excellent accord with that expected from the know surface grating and distribution of incident wavelengths. The dependence of the computed Debye-Waller factors upon T sub s, the surface Debye temperature and the gas-surface

AD-A162 693

AD-A162 692

UNCLASSIFIED

PAGE 71 EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 692

CONTINUED

potential well depth is found to be accurately described by the simplified expressions developed by Beeby and by Comsa et al. In general, the method is shown to be well suited to the study of elastic and inelastic gas-surface processes. (Reprints)

DESCRIPTORS: (U) \*ELASTIC SCATTERING, \*INELASTIC SCATTERING, \*GAS SURFACE INTERACTIONS, \*MOLECULAR BEAMS, \*WAVE PACKETS, DIFFRACTION, PATTERNS, ELASTIC PROPERTIES, ATOMS, SURFACES, HIGH TEMPERATURE, SURFACE TEMPERATURE, POWER SPECTRA, SCATTERING, GRATINGS(SPECTRA), REPRINTS, COEFFICIENTS, TRANSFER

IDENTIFIERS: (U) Debye Waller factor, PE81102F, WUAFOSR230383

AD-A162 689 11/4 20/11

GEORGIA INST OF TECH ATLANTA SCHOOL OF AEROSPACE ENGINEERING

(U) Analysis and Experiments on Interlaminar Fracture Toughness in Resin Matrix Composites.

DESCRIPTIVE NOTE: Final scientific rept. 1 Jan 83-14 Apr 85.

JUL 85 58P

PERSONAL AUTHORS: Rehfield, Lawrence W. ; Armanios, Erian A. ; Reddy, Ambur D. ;

CONTRACT NO. AFOSR-83-0058

PROJECT NO. 2307

TASK NO. B2

MONITOR: AFOSR  
TR-85-1075

UNCLASSIFIED REPORT

ABSTRACT: (U) This final report summarizes the objectives, accomplishments and proposed new direction of research on mode II interlaminar fracture in resin matrix composites. A mode II interlaminar fracture specimen, test and analysis method for interpreting results have been successfully developed and demonstrated for the AS4/3502 material system. Experimental data have been obtained under both net tensile and compressive loading. Of considerable importance are the findings that the AS4/3502 material system show increasing resistance to crack growth in tension, 2) interlaminar fracture under compression is a totally unstable process, and 3) tension and compression behaviors are considerably different. The findings and the conclusions that are drawn from them point to new, promising directions. Complementary experiments on low cycle fatigue in tension and compression and on mode I suppression in tension have been performed. The former basically confirm the static findings. The latter illustrate the potential effectiveness of mode I suppression technology and help to clarify mixed mode fracture.

DESCRIPTORS: (U) \*TOUGHNESS, \*FRACTURE(MECHANICS).

AD-A162 692

AD-A162 689

UNCLASSIFIED

PAGE 72

EVK551

UNCLASSIFIED

OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 689 CONTINUED

AD-A162 682 7/4 20/8

\*COMPOSITE MATERIALS, COMPRESSION, MULTIMODE, SUPPRESSION,  
TENSILE PROPERTIES, CRACK PROPAGATION, RESISTANCE, CYCLES,  
FATIGUE, COMPRESSIVE PROPERTIES, MATRIX MATERIALS,  
POLYMERS, COMPOSITE STRUCTURES

COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY

(U) Singlet-Triplet Interconversion of Diphenylmethylene  
Energetics, Dynamics and Reactivities of Different  
Spin States,

IDENTIFIERS: (U) Delamination, WUAFOSR230782, PE61102F

85 13P

PERSONAL AUTHORS: Eisenthal, K. B. ; Turro, N. J. ; Sitzmann,  
E. V. ; Gould, I. R. ; Hefferon, G. ;

CONTRACT NO. AFOSR-84-0040

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-85-1003

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Tetrahedron, v41 n8 p1543-  
1554 1985.

ABSTRACT: (U) A combination of picosecond and nanosecond  
laser spectroscopy measurements, chemical quenching  
experiments and triplet sensitization experiments has  
allowed the determination of the rapid singlet to triplet  
and slower triplet to singlet intersystem crossing rates  
for diphenylmethylene in fluid solution at room  
temperature. It is shown that under the conditions of the  
kinetic measurements, singlet and triplet  
diphenylmethylene (1DPM and 3 DPM, respectively) are in  
rapid equilibrium relative to reactions, so that knowledge  
of the values of  $k_{sub st}$  and  $k_{sub st}$  allows  
determination of the equilibrium constant and change in  
free energy for the 1DPM in equilibrium with DPM process.  
The absolute reactivity of 1DPM toward a series of  
alcohols has been determined and is discussed in terms of  
other current investigations of carbene reactivity.  
(Reprints)

DESCRIPTORS: (U) \*SPIN STATES, \*METHYLENES, \*PHENYL  
RADICALS, \*REACTION KINETICS, CROSSINGS, ENERGETIC  
PROPERTIES, FLUIDS, SOLUTIONS(GENERAL), KINETICS,  
MEASUREMENT, REPRINTS, DYNAMICS, CONSTANTS,  
EQUILIBRIUM(GENERAL), FREE ENERGY, LASERS, MEASUREMENT,

AD-A162 689

AD-A162 682

UNCLASSIFIED

PAGE 73 EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 682 CONTINUED

AD-A162 681 12/1

SPECTROSCOPY, ROOM TEMPERATURE, QUENCHING, RATES

FLORIDA STATE UNIV TALLAHASSEE DEPT OF STATISTICS

IDENTIFIERS: (U) Singlet states, Triplet states,  
PEB1102F, WUAFOSR230382

(U) Transformations which Preserve Convexity,

85 8P

PERSONAL AUTHORS: Fontenot, Robert A. ; Proschan, Frank ;

CONTRACT NO. F49620-82-K-0007

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-85-1020

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in International Jnl. of Math. &  
Math. Science, v8 n1 p49-55 1985.

ABSTRACT: (U) This reprint studies several natural  
models for multivariate extension of the Marshall-  
Proschan result. It is shown that these result in  
essentially a restatement of the original Marshall-  
Proschan characterization. Keywords: Permutation matrices;  
Functions(Mathematics). (Author)

DESCRIPTORS: (U) \*MATHEMATICAL MODELS,  
\*TRANSFORMATIONS(MATHEMATICS), REPRINTS, PERMUTATIONS,  
MATRICES(MATHEMATICS), FUNCTIONS(MATHEMATICS),  
MULTIVARIATE ANALYSIS, MODELS

IDENTIFIERS: (U) PEB1102F, WUAFOSR2304A5

AD-A162 682

AD-A162 681

UNCLASSIFIED

PAGE 74

EVK551

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

## SEARCH CONTROL NO. EVK551

AD-A162 680 9/3

AD-A162 548 7/4

TEXAS TECH UNIV LUBBOCK DEPT OF ELECTRICAL ENGINEERING

OKLAHOMA STATE UNIV STILLWATER DEPT OF CHEMISTRY

(U) On a Theory of Control for Linear Systems Over Rings and Nonlinear/Time-Varying Systems.

(U) Theoretical Investigations of the CVD (Chemical Vapor Deposition) of Silicon from Silane.

DESCRIPTIVE NOTE: Final rept. 1 Jul 84-30 Jun 85.

DESCRIPTIVE NOTE: Final rept. 1 Sep 82-31 Aug 85.

SEP 85 6P

AUG 85 20P

PERSONAL AUTHORS: Emre, Erol ;

PERSONAL AUTHORS: Raff, Lionel M. ; Thompson, Donald L. ;

CONTRACT NO. AFOSR-82-0282

CONTRACT NO. AFOSR-82-0311

PROJECT NO. 2304

PROJECT NO. 2303

TASK NO. A6

TASK NO. B3

MONITOR: AFOSR  
TR-85-0991MONITOR: AFOSR  
TR-85-1032

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) During the grant period the principal investigator wrote 18 research papers. Titles include Regulation of Linear Systems Over Rings by Dynamic Output Feedback, Control of Linear Systems with Fixed Noncommensurate Point Delays, On regulation of Linear Systems by Dynamic Output Feedback, On Globally Stable Adaptive Control, and Continuous Stabilization of Time-Varying Systems Over Parameters Approach. (Author)

ABSTRACT: (U) The results of a program of theoretical research to determine the relative importance and dynamics of various elementary processes occurring in the chemical vapor deposition (CVD) of silicon from silane are reported. The processes studied include the gas-phase unimolecular dissociation of SiH<sub>4</sub>, CH<sub>4</sub>, and SiH<sub>2</sub>, the homogeneous three-body recombination of Si atoms, surface adsorption and diffusion of Si atoms on Si(100) and Si(111) surfaces, and the recombination and desorption of H<sub>2</sub> on silicon surfaces. In addition, several studies involving the reaction dynamics of van der Waals molecules are described. We also report the development of a quantum mechanical method for computing the results of elastic and inelastic atomic scattering from surfaces. (Author)

DESCRIPTORS: (U) \*CONTROL THEORY, \*LINEAR SYSTEMS, STABILIZATION, DYNAMICS, FEEDBACK, OUTPUT, RINGS, ADAPTIVE CONTROL SYSTEMS, STABILITY, NONLINEAR SYSTEMS, TIME, VARIATIONS

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A6

DESCRIPTORS: (U) \*SURFACE CHEMISTRY, \*SILICON, \*VAPOR DEPOSITION, CHEMICAL DISSOCIATION, DIFFUSION, MOLECULAR ASSOCIATION, ELASTIC SCATTERING, INELASTIC SCATTERING, QUANTUM THEORY, ATOMS, DYNAMICS, DESORPTION, RECOMBINATION REACTIONS, ADSORPTION, SURFACES, CHEMICAL REACTIONS, SILANES, SOLAR CELLS

IDENTIFIERS: (U) PE81102F, WUAFOSR2303B3

AD-A162 680

AD-A162 548

## UNCLASSIFIED

PAGE 75

EVK551

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 501 12/1 21/2

AD-A162 497 7/2 7/5

RENSELAER POLYTECHNIC INST TROY NY

WISCONSIN UNIV-MADISON DEPT OF CHEMISTRY

(U) Numerical Study of Quenching of Inward Propagating Spherical Flames.

85 15P

85 3P

PERSONAL AUTHORS: Flaherty, J. E.; Frankel, M. L.; Roytburd, V.; Sivashinsky, G. I.;

PERSONAL AUTHORS: Pachaly, Bernd; West, Robert;

CONTRACT NO. DAAG29-82-K-0197, AFOSR-80-0192

CONTRACT NO. F49620-83-C-0044

PROJECT NO. 2304

PROJECT NO. 2303

TASK NO. A3

TASK NO. B2

MONITOR: AFOSR, ARD

MONITOR: AFOSR  
TR-85-1007

TR-85-1044, 19512.8-MA

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Combustion Science and Technology, v43 p245-257 1985.

SUPPLEMENTARY NOTE: Pub. in Jnl. of American Chemical Society, v107 p2987-2988 1985.

ABSTRACT: (U) The phenomenon of quenching of cylindrical convergent flames is considered in the framework of constant density approximation. The parametric dependence of the effect is studied numerically using an adaptive finite element method. The numerical results are in good agreement with predictions of theoretical analysis from Frankel and Sivashinsky (1984). Keywords: Spherical flames. (Reprints).

ABSTRACT: (U) The synthesis of a 1,3-dibora-2,4-dioxetane 1 and its photolysis to give trapping products consistent with intermediate formation of the oxoborane 2 is reported here.

DESCRIPTORS: (U) \*NUMERICAL ANALYSIS, \*FLAMES, CONSTANTS, CONVERGENCE, DENSITY, FINITE ELEMENT ANALYSIS, MATHEMATICAL PREDICTION, PARAMETRIC ANALYSIS, QUENCHING, REPRINTS, THEORY

IDENTIFIERS: (U) Spherical flames, PE61102F, WUAFOSR2304A3

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2

AD-A162 501

AD-A162 497

UNCLASSIFIED

PAGE 76

EVK551



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 442 17/4 9/2

AD-A162 442 CONTINUED

CITY COLL NEW YORK COMMUNICATIONS SYSTEMS LAB

(U) Spread Spectrum Acquisition and Tracking.

DESCRIPTIVE NOTE: Final rept. 30 Jun 84-30 Jun 85,

NOV 85 51P

PERSONAL AUTHORS: Schilling, Donald L. ; Kayser, H. ;

CONTRACT NO. AFOSR-83-0102

PROJECT NO. 2305

TASK NO. 83

MONITOR: AFOSR  
TR-85-1066

UNCLASSIFIED REPORT

ABSTRACT: (U) This report discusses the following subjects: An acquisition scheme for a frequency-hopped SS signal received over a Rayleigh multipath channel with random delay time. We consider relatively fast FH with a hopping rate of 1 KHZ and 127 different hopping frequencies. The received signal is embedded in white Gaussian noise. While the above problem appears to be specific the approach given below is general and can be generalized further. In this case, ignoring the spreading effect, there will be a possible overlapping between only three adjacent frequencies. For such a case we propose an optimum receiver and acquisition scheme whose characteristics are analyzed mathematically and by computer simulation. We characterize the performance of the acquisition scheme by the probability of detection for given probability of false acquisition when the input signal is white Gaussian noise only. The probability of detection is the probability that, at the end of the observation period, the desired signal code sequence is detected. Keywords include: Spread spectrum; Acquisition; Simulation; Direct sequence; and Frequency hopping.

DESCRIPTORS: (U) \*COMPUTERIZED SIMULATION, \*SEQUENCES, \*RECEIVERS, \*ACQUISITION, \*SPREAD SPECTRUM, \*TRACKING, INPUT, SIGNALS, OPTIMIZATION, PROBABILITY, CODING, DETECTION, OBSERVATION, FREQUENCY, DELAY, TIME, SIMULATION, GAUSSIAN NOISE, WHITE NOISE

AD-A162 442

AD-A162 442

UNCLASSIFIED

PAGE 77

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 433 CONTINUED

AD-A162 433 22/2

WEA CAMBRIDGE MA

(U) Wave Measurements on Truss Model.

DESCRIPTIVE NOTE: Technical rept. 1 Jan 84-1 Sep 85.

SEP 85 72P

DESCRIPTORS: (U) \*SPACECRAFT COMPONENTS, \*TRUSSES, COMPOSITE STRUCTURES, POLYESTER PLASTICS, ALUMINUM, JOINTS, EARTH ORBITS, FIBERGLASS, RODS, MACHINING, SPACE TECHNOLOGY, FREQUENCY, COMPOSITE MATERIALS, REINFORCING MATERIALS, TRANSDUCERS, ULTRASONICS, SPACECRAFT, PYRAMIDS, MODELS, MEASUREMENT, WAVES, WAVE PROPAGATION, VIBRATION

IDENTIFIERS: (U) Tetrahedrons, PE61102F, AFOSR230781

PERSONAL AUTHORS: Williams, James H., Jr.; Ou, Howard L.; Lee, Samson S.;

CONTRACT NO. F48820-83-C-0092

PROJECT NO. 2307

TASK NO. B1

MONITOR: AFOSR  
TR-85-1077

#### UNCLASSIFIED REPORT

ABSTRACT: (U) Large space structures (LSS) are large periodic lattice structures being considered for space applications in earth orbit. The vibration and wave propagation characteristics of these structures can affect their performance, integrity and the ability to nondestructively assess that integrity. In this preliminary study, the wave propagation characteristics of a tetrahedral truss model consisting of fiberglass reinforced composite rods and aluminum joints are observed experimentally. Longitudinal ultrasonic transducers are coupled to the joints of the truss model. The input signal consists of a gated sinusoid having a center frequency of 280 kHz. Because a tetrahedral truss, a commonly proposed LSS configuration can be constructed from basic repeating units of tetrahedrons and pyramids, only tetrahedrons and pyramids are considered. Tetrahedrons and pyramids are constructed by inserting fiberglass reinforced polyester rods 0.193 cm (0.076 in) in diameter and 18.72 cm (7.37 in) in length into machined 2024-T4 aluminum joints. Because a tetrahedral truss requires only two types of joints, the tetrahedrons and pyramids are constructed using the two types of joints. The cutting of the fiberglass rods, the machining of the aluminum joints and the final assembly of tetrahedrons and pyramids are done with great care to minimize structure variability.

AD-A162 433

AD-A162 433

UNCLASSIFIED

PAGE

78

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 432

21/5

AD-A162 432 CONTINUED

PURDUE UNIV LAFAYETTE IN SCHOOL OF MECHANICAL  
ENGINEERING

(U) Research on Aero-Thermodynamic Distortion Induced  
Structural Dynamic Response of Multi-Stage Compressor  
Blading.

DESCRIPTIVE NOTE: Annual rept. 16 Apr 83-15 Apr 84.

JUN 84 60P

PERSONAL AUTHORS: Fleeter, Sanford ;

REPORT NO. ME-TSPC-TR-84-03

CONTRACT NO. F49620-83-K-0028

PROJECT NO. 2307

TASK NO. A4

MONITOR: AFOSR  
TR-85-1080

UNCLASSIFIED REPORT

ABSTRACT: (U) The structural dynamic response of turbomachinery components to aero-thermodynamic distortion induced excitations is of major concern in the design of advanced gas turbine engines. The rotor speeds at which these resonant forced responses occur can be predicted with Campbell diagrams. However, due to the inadequacies of the existing time-variant aerodynamic models, no accurate prediction can currently be made for the amplitude of the resulting stresses. The overall objective of this research program is to quantitatively investigate the fundamental phenomena relevant to aerothermodynamic distortion induced structural dynamic blade response in multi-stage gas turbine fans and compressors. Progress during this reporting period includes: the calibration of stator vanes instrumented with dynamic pressure transducers; the completion and verification of the steady and dynamic data acquisition and analysis procedures; the check-out and initial experimental study of the first state vane row unsteady aerodynamics; the initiation of the development of the dynamic instrumentation and calibration procedures for the rotor studies; and the completion of the structural

AD-A162 432

AD-A162 432

UNCLASSIFIED

PAGE

79

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 431 12/1

AD-A162 430 7/4 7/5

NORTHWESTERN UNIV EVANSTON IL

STANFORD UNIV CA DEPT OF CHEMISTRY

(U) Markov Processes Applied to Control, Replacement, and Signal Analysis.

(U) Theory and Experiments on Chemical Instabilities.

DESCRIPTIVE NOTE: Annual rept. 1 Jun 84-31 May 85.

DESCRIPTIVE NOTE: Final technical rept. 1 Jan 84-30 Mar 85.

OCT 85 7P

JUN 85 10P

PERSONAL AUTHORS: Cinlar, Erhan ;

PERSONAL AUTHORS: Ross, John ;

CONTRACT NO. AFOSR-82-0189

CONTRACT NO. F49620-84-C-0030

PROJECT NO. 2304

PROJECT NO. 2303

TASK NO. A5

TASK NO. B1

MONITOR: AFOSR  
TR-85-1085

MONITOR: AFOSR  
TR-85-1001

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The concept of intrinsic age was introduced to relate the deterioration of a component under field conditions to the deterioration it would have experienced under laboratory conditions. Work has begun on research into random shapes. Additional research was performed on the stability of a harmonic oscillator in the presence of small noise. Keywords include: Intrinsic age; Random shapes; and Optimal replacement.

ABSTRACT: (U) Progress is reported on experiments and theoretical studies of chemical instabilities including chemical waves, photo-illuminated thermal, chemical reactions; critical slowing down, periodic precipitation processes; resonance phenomena in oscillatory reactions, rate of entropy production in systems far from equilibrium. Keywords: molecular structure; chemical precipitation. (Author)

DESCRIPTORS: (U) \*MARKOV PROCESSES, DETERIORATION, FIELD CONDITIONS, HARMONIC GENERATORS, LABORATORIES, NOISE, OPTIMIZATION, REPLACEMENT, APPLIED MATHEMATICS, OSCILLATORS, SHAPE, SIGNALS

DESCRIPTORS: (U) \*CHEMICAL REACTIONS, \*MOLECULAR STRUCTURE, ION, CHEMICAL PROPERTIES, CHEMICALS, ENTROPY, MOLECULAR STRUCTURE, OSCILLATION, PRECIPITATION, OSCILLATION, PRODUCTION, RATES, RESONANCE, STABILITY, TEST AND EVALUATION, THERMOCHEMISTRY, THEORY, WAVES, CHEMICAL PRECIPITATION, PHOTOCHEMICAL REACTIONS

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A5

IDENTIFIERS: (U) PE81102F, AFOSR2303B1

AD-A162 431

AD-A162 430

UNCLASSIFIED

PAGE 80

EVK551

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 398 12/1

AD-A162 394 20/12 20/8

NORTH CAROLINA UNIV AT CHAPEL HILL CENTER FOR STOCHASTIC PROCESSES

HONEYWELL INC BLOOMINGTON MN

(U) Extrema and Level Crossings of  $x(2)$  Processes.

(U) Nonlinear Optical Phenomena in Solids.

DESCRIPTIVE NOTE: Technical rept. Sep 84-Aug 85,

DESCRIPTIVE NOTE: Final technical rept. 1 Sep 81-15 Jun 85,

AUG 85

JUL 85 31P

PERSONAL AUTHORS: Aronovich, Michael ; Adler, Robert J. ;

PERSONAL AUTHORS: Kruse, Paul W. ; Arch, David K. ;

REPORT NO. TR-113

CONTRACT NO. F49820-81-C-0034

CONTRACT NO. F49820-82-C-0009

PROJECT NO. 2304

PROJECT NO. 2306

TASK NO. A5

TASK NO. C2

MONITOR: AFOSR

MONITOR: AFOSR

TR-85-0982

TR-85-1038

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) This document studies the sample path behavior of sq X processes in the neighborhood of their level crossings and extreme via the development of Slepian model processes. The results, aside from being of particular interest in the study of sq X processes, have a general interest insofar as they indicate which properties of Gaussian processes (which has been heavily researched in this regard) are mirrored or lost when the assumption of normality is not made. Particular emphasis is placed on the behavior of sq X processes at both high and low levels, these being of considerable practical importance. Also extended are previous results on the asymptotic Poisson form of the point process of high maxima to include also low minima (which are in a different domain of attraction) thus closing a gap in the theory of sq X processes. Keywords: Poisson limit; Stochastic processes.

DESCRIPTORS: (U) \*STOCHASTIC PROCESSES, MATHEMATICAL MODELS, BEHAVIOR, CROSSINGS, LIMITATIONS, NORMALITY, PATHS, POISSON DENSITY FUNCTIONS, STATISTICAL PROCESSES, DOCUMENTS

AD-A162 398

AD-A162 394

## UNCLASSIFIED

PAGE 81

EVK551

ABSTRACT: (U) The nonlinear optical properties of  $Hg(1-x)Cd(x)Te$  for x values between 0.20 and 0.23 have been evaluated experimentally under CO<sub>2</sub> laser excitation at 295 K, 77K, and 12 K. Optical phase conjugation arising from conduction band nonparabolicity and the photoexcited plasma mechanisms has been studied. A new effect in which the phase conjugate signal is erased or quenched by means of a separate CO<sub>2</sub> laser has been observed. The mechanism depends upon an enhanced Auger recombination rate due to two-photon absorption. Optical absorption data were obtained on eight samples of  $Hg(1-x)Cd(x)Te$  over the interval from 10 to 40 micrometers and interpreted theoretically in terms of interband, intraband, impurity, and lattice absorption measurements. The temporal behavior of degenerate four-wave mixing and optical bistability was studied theoretically for a superlattice or quantum well for both absorptive (photoexcited plasma) and dispersive (conduction band nonparabolicity) mechanisms. The third order susceptibility due to both conduction band nonparabolicity and the photoexcited plasma mechanisms in both GaAs/Al(x)Ga(1-x)As and  $Hg(1-x)Cd(x)Te/Hg(1-y)Cd(y)Te$  superlattices has been investigated theoretically.

DESCRIPTORS: (U) \*CADMIUM TELLURIDES, \*MERCURY COMPOUNDS, \*OPTICAL PROPERTIES, IMPURITIES, NONLINEAR SYSTEMS,

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 394 CONTINUED

AD-A162 393 12/1

OPTICAL DATA, OPTICAL PHENOMENA, CONDUCTION BANDS,  
QUANTUM THEORY, RECOMBINATION REACTIONS, GALLIUM  
ARSENIDES, ALUMINUM, TWO PHOTON ABSORPTION

NORTH CAROLINA UNIV AT CHAPEL HILL DEPT OF STATISTICS  
(U) Research in Stochastic Processes.

IDENTIFIERS: (U) \*Cadmium Mercury tellurides, Four wave  
mixing, Superlattices, Quantum wells, Optical bistability,  
PEB1102F, WJAFOSR2306C2

DESCRIPTIVE NOTE: Final rept. 1 Nov 81-31 Aug 85,

SEP 85 80P

PERSONAL AUTHORS: Carroll, Raymond J. ; Kallianpur, Gopinath  
; Leadbetter, M. R. ;

CONTRACT NO. F49820-82-C-0009

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-85-1088

UNCLASSIFIED REPORT

ABSTRACT: (U) The research of four principal  
investigators as well as the operations of the Center for  
Stochastic Processes was supported by this grant.  
Substantial research progress was made in stochastic  
processes and in statistical estimation and inference.  
More than 135 journal articles were published or accepted  
for publication. The work of 19 visiting scholars was  
supported. Keywords: Robust regression; extremal theory;  
signal processing. (Author)

DESCRIPTORS: (U) \*STOCHASTIC PROCESSES, OPERATION,  
ESTIMATES, STATISTICS, SIGNAL PROCESSING, STATISTICAL  
INFERENCE, REGRESSION ANALYSIS

IDENTIFIERS: (U) Robustness, PEB1102F, WJAFOSR2304A5

AD-A162 394

AD-A162 393

UNCLASSIFIED

PAGE 82

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 392 20/3 20/13

AD-A162 389 5/7 6/4

STANFORD UNIV CA DEPT OF PHYSICS

SRI INTERNATIONAL MENLO PARK CA

(U) Fundamental Experiments at Liquid Helium Temperatures  
(Low Temperature Studies of Anomalous Surface  
Shielding and Related Phenomena).

(U) Knowledge Representation and Natural-Language  
Semantics.

DESCRIPTIVE NOTE: Final rept. 10 Jan 79-30 Sep 84,

DESCRIPTIVE NOTE: Final rept. 1 Jun 82-30 May 85,

SEP 84 42P

AUG 85 349P

PERSONAL AUTHORS: Fairbank, William M.; Madey, John M. J. ;

PERSONAL AUTHORS: Moore, Robert C. ;

CONTRACT NO. AFOSR-80-0028

CONTRACT NO. F49620-82-K-0031

PROJECT NO. 2301

PROJECT NO. 2304

TASK NO. A9

TASK NO. A7

MONITOR: AFOSR  
TR-85-1088

MONITOR: AFOSR  
TR-85-1098

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) It was found that an electron in an evacuated dewar, falling under the influence of gravity, experiences a net force of  $10(-5)$  to  $10(-7)$  V/m from 300 to about 4.5 degrees-K. At 4.5 degrees-K there is a transition to a net force of zero to within  $8 \times 10(-12)$  V/m. This effect has been traced to the creation of a 2-D surface plasma of free electrons on the walls of the copper free-fall tube at the transition temperature.

DESCRIPTORS: (U) \*FREE ELECTRONS. \*FREE FALL MODELS. \*CRYOGENICS, GRAVITY, LIQUID HELIUM, LOW TEMPERATURE, SHIELDING, ANOMALIES, COPPER, TRANSITION TEMPERATURE, TUBES, WALLS, PLASMAS(PHYSICS), ELECTROMAGNETIC SHIELDING

IDENTIFIERS: (U) Surface plasmas. WUAFOSR2301A9, PE81102F

ABSTRACT: (U) This report summarizes three years of research on a project to produce formalisms, suitable for manipulation by computer, for the representation of specific concepts that are important for natural-language semantics, and to give an independent account of the meaning of such representations using the tools of formal logic. Specific topics on which progress was made include: a logic that characterizes systems that represent and reason with information about their own beliefs, a formalism for the representation of information about the interdependence of knowledge and action, a semantic analysis of adverbial modifiers and event sentences, a formal model of belief based on deduction, additional results on the formal semantics of our logic for reasoning about one's own beliefs, a belief logic that makes weaker than usual assumptions about introspection, and a mathematically rigorous theory of plan synthesis. Originator-supplied keywords: Artificial intelligence; Logic of belief; Automatic planning; Knowledge representation; Logic of knowledge and action; Natural-language semantics; and Nonmonotonic logic.

DESCRIPTORS: (U) \*SEMANTICS. \*NATURAL LANGUAGE. \*ARTIFICIAL INTELLIGENCE. \*LOGIC. COMPUTER APPLICATIONS, REASONING, INFORMATION PROCESSING, AUTOMATIC, PLANNING

AD-A162 392

AD-A162 389

UNCLASSIFIED

PAGE 83

EVK551

UNCLASSIFIED

OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 389 CONTINUED

AD-A162 388 14/2 7/4

IDENTIFIERS: (U) \*Knowledge representation, Belief logic,  
Logic of knowledge and action, Nonmonotonic logic,  
Adverbial modifiers, Deduction, PE81102F, WUAFOSR2304A7

LITTON SYSTEMS INC WOODLAND HILLS CA GUIDANCE AND  
CONTROL SYSTEMS DIV

(U) Investigation of Rubidium Hyperfine Structure  
Frequency Stabilization Mechanisms.

DESCRIPTIVE NOTE: Final rept. Aug 83-Jul 84.

AUG 84 74P

PERSONAL AUTHORS: McClelland, T. ; Kwon, T. M. ;

CONTRACT NO. F49620-83-C-0132

PROJECT NO. 2301

TASK NO. A4

MONITOR: AFOSR  
TR-85-1103

UNCLASSIFIED REPORT

ABSTRACT: (U) The linewidth and frequency associated with the ground state hyperfine energy of Rb 87 has been studied. A stable single mode semiconductor laser is used to optically pump Rb, in order to obtain a highly collimated, monochromatic light source. The laser is stabilized by locking its optical frequency to the Rb absorption line center. The dependence of the hyperfine frequency and resonance linewidth have been measured as a function of temperature, light intensity and microwave power; and a theoretical description of the linewidth vs. temperature data is presented. Keywords: Optical pumping; Rubidium; Frequency standard; Frequency shift; Light shift; Density matrix; Buffer gas; Linewidth; and Magnetic resonance.

DESCRIPTORS: (U) \*OPTICAL PUMPING, \*HYPERFINE STRUCTURE, \*FREQUENCY STANDARDS, \*SPECTRAL LINES, ABSORPTION SPECTRA, LINE SPECTRA, FREQUENCY SHIFT, TEMPERATURE, INTENSITY, LIGHT SOURCES, MONOCHROMATIC LIGHT, RUBIDIUM, BUFFERS, GASES, MICROWAVES, RADIOFREQUENCY POWER, RESONANCE, TEMPERATURE, MAGNETIC RESONANCE, LASER APPLICATIONS

IDENTIFIERS: (U) PE81102F, WUAFOSR2301A4

AD-A162 389

AD-A162 388

UNCLASSIFIED

PAGE 84

EVK551



## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 387 11/6 13/8

AD-A162 385 12/1

COLUMBIA UNIV NEW YORK CENTER FOR STRATEGIC MATERIALS

CORNELL UNIV ITHACA NY

(U) Understanding the HIP (Hot Isostatic Pressing) Consolidation of P/M Nickel-Base Superalloys.

(U) Nonlinear Dynamics and Chaotic Motions in Feedback Controlled Elastic Systems.

DESCRIPTIVE NOTE: Annual progress rept. 1 Oct 82-30 Sep 83.

DESCRIPTIVE NOTE: Annual rept. 1 Dec 83-30 Nov 84,

JUN 85 15P

AUG 85 29P

PERSONAL AUTHORS: Tien, John K. ;

PERSONAL AUTHORS: Holmes, P. J. ; Moon, F. C. ; Rand, R. H. ;

CONTRACT NO. AFOSR-82-0352

CONTRACT NO. AFOSR-84-0051

PROJECT NO. 2308

PROJECT NO. 2304

TASK NO. A1

TASK NO. A4

MONITOR: AFOSR

MONITOR: AFOSR

TR-85-0984

TR-85-1087

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) Superalloy powders have been completely characterized. The different size distributions of powders have been containerized and are ready for HIP at the commercial condition of pressure and temperature, which is 15 ksi at 2050 degrees F. All creep specimens are machined and creep tests are now under way (two creep runs have already been completed). Framework for the new HIP model has been developed in order to include unequal particle sizes. Keywords: Hot Isostatic Pressing; Alloy Powders; Consolidation.

ABSTRACT: (U) Local and global bifurcation studies of nonlinear systems subject to linear and nonlinear feedback forces have been completed which have application to robotic devices or controlled elastic structures. Related to these studies has been the application of mathematical knot theory to trace certain bifurcation sequences for two-dimensional maps. This work has led to the conclusion that many other routes to chaos in dynamical systems exist besides period doubling when the map is two-dimensional. The use of computer algebra (MACSYMA) has been developed as a tool to study nonlinear systems. In one application the investigators explored a new control scheme for flexible space structures based on controlling the stiffness matrix. MACSYMA was used along with normal form theory to predict the stability properties of a stiffness controlled systems. Other studies using MACSYMA related to problems in robotic dynamics were also completed or started. Finally, experimental work was completed involving the application of mathematics to chaotic motion of flexible structures.

DESCRIPTORS: (U) \*HOT PRESSING, \*ISOSTATIC PRESSING, \*SUPERALLOYS, \*POWDER ALLOYS, \*NICKEL ALLOYS, CREEP, CREEP TESTS, DISTRIBUTION, PARTICLE SIZE, POWDERS, HIGH PRESSURE, HIGH TEMPERATURE, MACHINING, DEFORMATION, VARIATIONS

IDENTIFIERS: (U) HIP(Hot Isostatic Pressing), Particle size distribution, PE61102F, WUAFOSR2308A1

DESCRIPTORS: (U) \*BIFURCATION(MATHEMATICS), NONLINEAR SYSTEMS, COMPUTERS, CONTROL, CONTROL SYSTEMS, DYNAMICS, ELASTIC PROPERTIES, FEEDBACK, ALGEBRA, FLEXIBLE STRUCTURES, MAPS, MATHEMATICS, MATRICES(MATHEMATICS), MOTION, ROBOTICS, STABILITY, STIFFNESS, LINEARITY,

AD-A162 387

AD-A162 385

UNCLASSIFIED

PAGE 85

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 385 CONTINUED

STRUCTURES, THEORY, TWO DIMENSIONAL, LINEARITY

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A4

AD-A162 384 9/2

CALIFORNIA UNIV BERKELEY ELECTRONICS RESEARCH LAB

(U) A Generalized DBMS to Support Diverse Data.

DESCRIPTIVE NOTE: Annual scientific rept. 1 Jul 83-30 Jun 84,

SEP 85 93P

PERSONAL AUTHORS: Rowe, L. ; Stonebraker, M. ; Wong, E. ;

CONTRACT NO. AFOSR-83-0254

PROJECT NO. 2304

TASK NO. A2

MONITOR: AFOSR  
TR-85-0989

UNCLASSIFIED REPORT

ABSTRACT: (U) The authors proposed a research program to develop a generalized database manager to support diverse kinds of data including text, icons, forms, maps and other spatial data. The proposed research also included investigating support for integrated data browsers to allow end-users to query, step through, and update diverse data. Specific topics to be investigated included query language facilities to support text and geometric data, user-defined abstract data types in a DBMS, an ordered relation access method for text and other ordered data, extended secondary indexes, main memory databases, concurrency control for data browsers, and an application program interface based on windows. This paper reports on our progress during the first year of this program. The major advances have been made in the areas of abstract data types, main memory data bases and extended secondary indexes. (Author)

DESCRIPTORS: (U) \*DATA MANAGEMENT, \*DATA BASES, INTERFACES, GEOMETRY, MEMORY DEVICES, FACILITIES, INTERROGATION, INDEXES, SECONDARY

IDENTIFIERS: (U) \*Data base management systems, PE81102F, WUAFOSR2304A2

AD-A162 385

AD-A162 384

UNCLASSIFIED

PAGE 86

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 382

12/1

AD-A162 379

12/1

PITTSBURGH UNIV PA CENTER FOR MULTIVARIATE ANALYSIS

NORTHWESTERN UNIV EVANSTON IL

(U) On Tests for Selection of Variables and Independence  
under Multivariate Regression Model.

(U) Monte Carlo Reliability Analysis.

DESCRIPTIVE NOTE: Technical rept.,

DESCRIPTIVE NOTE: Annual technical rept. 1 Sep 84-31 Aug  
85,

AUG 85

50P

NOV 85

3P

PERSONAL AUTHORS: Kariya, T.; Fujikoshi, Y.; Krishnalah, P.  
R.;

PERSONAL AUTHORS: Lewis, E. E.;

REPORT NO. TR-85-33

CONTRACT NO. AFOSR-84-0340

CONTRACT NO. F49620-85-C-0008

PROJECT NO. 2304

PROJECT NO. 2304

TASK NO. A5

TASK NO. A5

MONITOR: AFOSR  
TR-85-1092

MONITOR: AFOSR  
TR-85-0874

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) In this paper, the authors consider various procedures for testing the hypotheses of independence of two sets of variables and certain regression coefficients are zero under the classical multivariate regression model. Various properties of these procedures and the asymptotic distributions associated with these procedures are also considered. Keywords: Correlated multivariate regression equations; Growth curve model; Multivariate distributions; Optimum properties. (Author)

DESCRIPTORS: (U) \*STATISTICAL TESTS, \*MULTIVARIATE ANALYSIS, \*ASYMPTOTIC SERIES, \*GRAPHS, \*GROWTH(GENERAL) DISTRIBUTION, \*MATHEMATICAL MODELS, \*REGRESSION ANALYSIS, \*COEFFICIENTS, \*VARIABLES, \*HYPOTHESES, \*OPTIMIZATION, \*SELECTION

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A5

AD-A162 382

AD-A162 379

UNCLASSIFIED

PAGE 87

EVK551

ABSTRACT: (U) The work carried out during the 1984/85 contract year is divided into two parts. First, three classes of component dependency models have been successfully incorporated into the Markov Monte Carlo formulation: standby systems, shared load systems and shared repair crews. These models have been implemented in a computer code and used for the analysis of a number of complex systems. Second, the investigation of the Monte Carlo simulation of time-dependent failure was begun. Two different sampling techniques were formulated, and evaluation is continuing into the 1985/86 contract period. (Author)

DESCRIPTORS: (U) \*MONTE CARLO METHOD, \*RELIABILITY, \*SYSTEMS ANALYSIS, \*MATHEMATICAL MODELS, \*SAMPLING, \*SHARING, \*FAILURE, \*TIME DEPENDENCE, \*COMPUTER PROGRAMS, \*SIMULATION, \*CREWS, \*REPAIR

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A5

## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 378 12/1

AD-A162 374 12/1

IOWA STATE UNIV AMES DEPT OF MATHEMATICS

BROWN UNIV PROVIDENCE RI LEFSCHETZ CENTER FOR DYNAMICAL SYSTEMS

(U) Numerical Solution of Iii Posed Problems in Partial Differential Equations.

(U) Heteroclinic Orbits for Retarded Functional Differential Equations.

DESCRIPTIVE NOTE: Annual technical rept. 1 Oct 84-30 Sep 85.

DEC 84 51P

NOV 85 12P

PERSONAL AUTHORS: Hale, Jack K. ; Lin, X. S. ;

PERSONAL AUTHORS: Levine, Howard A. ;

REPORT NO. LCDS-84-39

CONTRACT NO. AFOSR-84-0252

CONTRACT NO. DAAG29-83-K-0029, AFOSR-84-0376

PROJECT NO. 2304

PROJECT NO. 2304

TASK NO. A3

TASK NO. A1

MONITOR: AFOSR  
TR-85-1094MONITOR: AFOSR  
TR-85-1018

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) Research was undertaken on questions concerning the existence, uniqueness, continuous data dependence and numerical computations of solutions of various ill posed problems in partial differential equations. It was shown that a potential well theory is possible for certain hyperbolic problems in which a nonlinear boundary condition is prescribed and not possible in certain cases when the forcing term in the differential equation is singular. Several papers were accepted or submitted during this period. Examples of titles are: Inequalities between Dirichlet and Neumann eigenvalues, and A potential well theory for the heat equation with a nonlinear boundary condition. Keywords: Partial differential equations; Hyperbolic problems; Continuous data. (Author)

DESCRIPTORS: (U) \*PARTIAL DIFFERENTIAL EQUATIONS, PROBLEM SOLVING, EIGENVALUES, INEQUALITIES, HYPERBOLAS, COMPUTATIONS, NUMERICAL ANALYSIS, SOLUTIONS(GENERAL), POTENTIAL THEORY, EQUATIONS, HEAT, BOUNDARIES, NONLINEAR SYSTEMS

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A3

AD-A162 378

AD-A162 374

## UNCLASSIFIED

PAGE 88

EVK551

SUPPLEMENTARY NOTE: Sponsored in part by Grant NSF-DMS82-05355.

ABSTRACT: (U) The purpose of this paper is to determine conditions for the occurrence of a heteroclinic orbit gamma function sub micron in a neighborhood of this function for micron in a neighborhood of zero. The authors also want to specify these conditions in terms of computable quantities which can be used to determine either the transversality or the order of nontransversality of the heteroclinic orbit. Keywords: differential equations; bifurcation functions.

DESCRIPTORS: (U) \*DIFFERENTIAL EQUATIONS, FUNCTIONAL ANALYSIS, ORBITS, RETARDATION, TRANSVERSE, BIFURCATION(MATHEMATICS)

IDENTIFIERS: (U) \*Heteroclinic orbits, PE81102F, WUAFOSR2304A1

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 373 20/3 20/10

AD-A162 372 5/2

NORTHWESTERN UNIV EVANSTON IL DEPT OF PHYSICS

AIR FORCE OFFICE OF SCIENTIFIC RESEARCH BOLLING AFB DC

(U) Superlattice Effects in Graphite Intercalation Compounds.

(U) AFOSR (Air Force Office of Scientific Research) Technical Report Summaries.

DESCRIPTIVE NOTE: Annual rept. 1 Oct 84-30 Sep 85,

DESCRIPTIVE NOTE: Quarterly rept. Jul-Sep 85,

OCT 85 30P

SEP 85 105P

PERSONAL AUTHORS: Markiewicz, R. S. ;

PERSONAL AUTHORS: Wert, Barbara J. ;

CONTRACT NO. F49620-82-C-0078

MONITOR: AFOSR  
TR-85-0985

PROJECT NO. 2308

TASK NO. C3

MONITOR: AFOSR  
TR-85-1038

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) A new kind of two-dimensional, field-induced phase transition has been discovered in Br<sub>2</sub> graphite intercalation compounds. Similar to, but much more pronounced than Condon domain formation in three-dimensions, it is a Landau level instability which results in two types of domains having different numbers of Landau levels occupied. The domains display a striking nonlinear dynamics in an a.c. magnetic field, with phenomena including resonance, hysteresis, and a quasiperiodic route to chaos. A theoretical basis for analyzing the data has been developed, and the high frequency resonance appears to be a transverse vibration of the domain array, similar to that predicted for the superconducting intermediate state. Keywords: quantum hall effect; solitons. (Author)

DESCRIPTORS: (U) \*HALL EFFECT, \*QUANTUM THEORY, \*SUPERCONDUCTORS, DOMAIN WALLS, GRAPHITE, LAYERS, MAGNETIC FIELDS, CRYSTAL LATTICES, PHASE SHIFT, HIGH FREQUENCY, RESONANCE, DYNAMICS, NONLINEAR SYSTEMS, TRANSVERSE, VIBRATION

IDENTIFIERS: (U) Quantum Hall effect, Solitons, Graphite intercalated systems, PE81102F, WUAFOSR2308C3

AD-A162 373

AD-A162 372

UNCLASSIFIED

PAGE 89

EVK551

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A182 371 20/11

AD-A182 370 20/11

GEORGIA INST OF TECH ATLANTA SCHOOL OF ENGINEERING  
SCIENCE AND MECHANICS

GEORGIA INST OF TECH ATLANTA SCHOOL OF ENGINEERING  
SCIENCE AND MECHANICS

(U) Buckling of Delaminated Shells and Multi-Annular  
Plates.

(U) Delamination Buckling and Growth of Flat Composite  
Structural Elements.

DESCRIPTIVE NOTE: Final rept. 1 Sep 84-31 Aug 85.

DESCRIPTIVE NOTE: Annual rept. 1 Jul 83-31 Aug 84.

OCT 85 159P

SEP 84 83P

PERSONAL AUTHORS: Simitses, George J. ; Sallam, Sayed ;  
Frostig, Yeoshua ;

PERSONAL AUTHORS: Simitses, George J. ; Sallam, Sayed ;

CONTRACT NO. AFOSR-83-0243

CONTRACT NO. AFOSR-83-0243

PROJECT NO. 2307

PROJECT NO. 2307

TASK NO. B1

TASK NO. B1

MONITOR: AFOSR

MONITOR: AFOSR  
TR-85-1081

TR-85-1081

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) Buckling of delaminated thin cylindrical shells is investigated. The thin cylinders are axially loaded and their geometry is virtually isotropic. The effects of boundary conditions, delamination size, and delamination position on the buckling load are studied. Buckling analysis of multi-annular plates is also presented. The annular sections are made of different materials, their size is varied, and the composite circular plates are supported in various ways. The rigidities of the various parts are varied in order to cover the cases of plates with holes, with rigid inclusion, and ring stiffeners. Keywords: Laminated shells; Delamination buckling; Damage tolerance; Annular plates; Plates with holes.

ABSTRACT: (U) Delamination buckling and growth of flat composite structural elements is presented with sufficient detail. The mathematical model for the phenomena are developed and solved. The emphasis of the analysis is to establish the load carrying capability (damage tolerance) of the delaminated structural element and to identify the most influencing structural parameters. Two important parameters have a governing influence on the behavior of the delaminated (damaged) element: the size of the delamination and its position in the laminate, especially its distance from the surface. Depending on these two parameters, the damage tolerance of the laminate is either governed by (delamination) buckling or by the fracture toughness of the material (delamination growth). Keywords: Laminated plates; Delamination buckling; Delamination growth; Damage tolerance.

DESCRIPTORS: (U) \*BUCKLING, \*LAMINATES, \*SHELLS(STRUCTURAL FORMS), HOLES(OPENINGS), SEPARATION, PLATES, DAMAGE, TOLERANCE, BOUNDARIES, RINGS, STIFFENING, CIRCULAR, COMPOSITE STRUCTURES, CYLINDRICAL BODIES, THINNESS

DESCRIPTORS: (U) \*BUCKLING, \*LAMINATES, \*PLATES, DAMAGE, TOLERANCE, GROWTH(GENERAL), SEPARATION, MATHEMATICAL MODELS, PARAMETERS, STRUCTURAL MEMBERS, FRACTURE(MECHANICS), TOUGHNESS, STRUCTURAL PROPERTIES

IDENTIFIERS: (U) \*Delamination, PE81102F, WUAFOSR2307B1

IDENTIFIERS: (U) \*Delamination, PE81102F, WUAFOSR2307B1

AD-A182 371

AD-A182 370

## UNCLASSIFIED

PAGE 80

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 355

9/2

IOWA UNIV IOWA CITY APPLIED-OPTIMAL DESIGN LAB

AD-A162 355

CONTINUED

IDENTIFIERS: (U) PE61102F, WJAFOSR230781

(U) Database Design for Structural Analysis and Design Optimization.

DESCRIPTIVE NOTE: Annual rept. Oct 83-Sep 84,

OCT 84

317P

PERSONAL AUTHORS: Arora, J. S. ; Haririan, M. ; Paeng, J. K. ;  
Ryu, Y. S. ; Sreekanta, T. ;

REPORT NO. CAD-SS-84-22

PROJECT NO. 2307

TASK NO. 81

MONITOR: AFOSR  
TR-85-1079

UNCLASSIFIED REPORT

ABSTRACT: (U) This report presents a procedure for design of database for structural analysis and design optimization. The procedure involves three distinct steps: (i) collection of information, (ii) analysis of data flow and (iii) identification of relations and data sets. The procedures is used to design a data base for analysis and design of systems for linear, nonlinear, static and dynamic responses. Databases of two existing analysis programs, ADINA and GIFTS, are studied to gain insights into their designs. These are the state-of-the-art analysis programs that create large databases. However their database management systems are tightly coupled to the program management that has been implemented on the PRIME system is described. The system implements both the numerical and relational data models. These models are judged to be more suitable for engineering applications. A detailed description of the capabilities of the system is presented. Using this system, the proposed database design will be implemented and evaluated in the future.

DESCRIPTORS: (U) \*DATA BASES, \*SYSTEMS ENGINEERING, DATA PROCESSING, FLOW, OPTIMIZATION, STATE OF THE ART, DATA MANAGEMENT, MODELS, DYNAMIC RESPONSE, STRUCTURAL ANALYSIS, DATA ACQUISITION

AD-A162 355

AD-A162 355

UNCLASSIFIED

PAGE

91

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 354 8/11

AD-A162 353 12/1

SCRIPPS INSTITUTION OF OCEANOGRAPHY LA JOLLA CA

(U) Analysis of MSS (Marine Seismic System) and OBS (Ocean Bottom Seismograph) Data Collected during the NGENDEI Seismic Experiment.

DESCRIPTIVE NOTE: Semi-annual rept. 1 Jan 84-30 Aug 85.

AUG 85 66P

PERSONAL AUTHORS: Orcutt, John A. ;

CONTRACT NO. AFOSR-84-0043, DARPA Order-4983

PROJECT NO. 4397

TASK NO. 05

MONITOR: AFOSR  
TR-85-1102

UNCLASSIFIED REPORT

ABSTRACT: (U) The results of the first year's data analysis employing data collected during the NGENDEI seismic experiment in the southwest Pacific are presented. This experiment tested the DARPA Marine Seismic System and verified the improved signal-to-noise ratio achieved by burying the instrument within the oceanic crust. The experiment, which took place on the Deep Sea Drilling Project Leg 91, was designed to test the Marine Seismic System (MSS) in a realistic environment near an active trench environment. An earlier test of the system in the northwest Pacific had been unsuccessful because of difficulties in drilling an acceptable borehole in the seafloor. The MSS was recorded aboard the D/V Glomar Challenger for several days of earthquake, refraction and environmental noise experiments. The subsequent deployment of an autonomous recording package on the seafloor was successful.

DESCRIPTORS: (U) \*SEISMOGRAPHS, DATA PROCESSING, DEEP OCEANS, DRILLING, ENVIRONMENTS, MARINE GEOPHYSICS, OCEAN BOTTOM, OCEANIC CRUST, SEISMIC WAVES, SEISMOLOGY, SIGNAL TO NOISE RATIO, TRENCHES

IDENTIFIERS: (U) PE81101E, WUAFOSR439705

AD-A162 354

UNCLASSIFIED

AD-A162 353

PAGE 92 EVK551

STATE UNIV OF NEW YORK AT STONY BROOK DEPT OF APPLIED MATHEMATICS AND STATISTICS

(U) Continuum Structure Functions.

DESCRIPTIVE NOTE: Annual rept. no. 1, 23 Jul 84-22 Jul 85.

SEP 85 17P

PERSONAL AUTHORS: Baxter, Laurence A. ;

CONTRACT NO. AFOSR-84-0243

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-85-1095

UNCLASSIFIED REPORT

ABSTRACT: (U) A continuum structure function is a nondecreasing mapping from the unit hypercube to the unit interval. The theory of such functions generalizes the traditional theory of binary and multistate structure functions, permitting more realistic and flexible modelling of systems subject to reliability growth, component degradation and partial availability. During the first year of work on this topic, the PI has developed a theory of modules (i.e. subsystems), calculated various sets of bounds on the distribution of the structure function when the component states are random variables, deduced axiomatic characterizations of two important special cases and derived a definition of the reliability importance of the various components. (Author)

DESCRIPTORS: (U) \*MAPPING(TRANSFORMATIONS), \*MATHEMATICAL MODELS, DEGRADATION, CONTINUUM MECHANICS, FUNCTIONS, RANDOM VARIABLES, GROWTH(GENERAL), RELIABILITY, INTERVALS, STRUCTURAL PROPERTIES, AVAILABILITY

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A5



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A182 352

11/4

AD-A182 352 CONTINUED

DREXEL UNIV PHILADELPHIA PA DEPT OF MECHANICAL  
ENGINEERING AND MECHANICS

(U) Fracture Behavior of Boron Aluminum Composites at Room  
and Elevated Temperatures.

DESCRIPTIVE NOTE: Final rept. 1 Apr 79-14 Apr 85.

APR 85 265P

PERSONAL AUTHORS: Averbuch, Jonathan ;

CONTRACT NO. AFOSR-79-0079

PROJECT NO. 2302

TASK NO. 82

MONITOR: AFOSR  
TR-85-1099

UNCLASSIFIED REPORT

ABSTRACT: (U) This report describes the results of research work on the deformation characteristics and failure mechanisms and processes of center-notched boron/aluminum laminates at room and elevated temperatures. This program has focused on the deformation characteristics in both the elastic and inelastic ranges, crack tip damage growth, notch sensitivity, toughness, failure mechanisms and processes and failure modes. The primary experimental technique has been to utilize the interferometric displacement gage (IDG) through which the actual crack opening displacement (COD) could be measured at room and elevated temperatures, resulting in precise load-COD and local compliance curves. Special attention has also been given to nondestructive examination techniques, in particular the acoustic emission technique, for monitoring internal damage initiation and progression during quasi-static and low cycle fatigue loading. Microstructural studies of the fracture surface morphologies have been conducted as well. The experimental studies contributed to the understanding of the effect of laminate configuration and test temperature on the fracture behavior of the subject material. The analytical study has focused in three major directions, namely: (1) predicting the elastic behavior; (2) application of semi-empirical fracture models for

AD-A182 352

AD-A182 352

UNCLASSIFIED

PAGE 93

EVK551

predicting the notch sensitivity; and (3) application, extension and modifications of approximate mechanistic models for predicting the deformation characteristics of unidirectional composites. (Author)

DESCRIPTORS: (U) \*FRACTURE(MECHANICS), \*LAMINATES, \*METAL MATRIX COMPOSITES, ACOUSTIC EMISSIONS, ALUMINUM, BORON, CRACKS, CYCLES, DAMAGE, DEFORMATION, DISPLACEMENT, ELASTIC PROPERTIES, FATIGUE(MECHANICS), GAGES, GROWTH(GENERAL), HIGH TEMPERATURE, INTERFEROMETRY, LOADS(FORCES), MICROSTRUCTURE, MODELS, MORPHOLOGY, NONDESTRUCTIVE TESTING, NOTCH SENSITIVITY, SURFACES, TEMPERATURE, TOUGHNESS, UNIDIRECTIONAL, CRACK PROPAGATION, FAILURE(MECHANICS)

IDENTIFIERS: (U) PE81102F, MUAFOSR2302B2

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A182 350

7/3

AD-A182 348

8/13

WISCONSIN UNIV-MADISON DEPT OF CHEMISTRY

FLORIDA UNIV GAINESVILLE DEPT OF CIVIL ENGINEERING

(U) Kinetics of Thermal Cis-Trans Isomerizations in Disilenes.

(U) Generalized Phenomenological Cyclic Stress-Strain-Strength Characterization of Anisotropic Granular Media.

85 5P

PERSONAL AUTHORS: Michalczuk, Michael J. ; West, Robert ; Michl, Josef ;

DESCRIPTIVE NOTE: Annual rept. 1 May-1 Jun 85.

JUN 85 284P

CONTRACT NO. F49620-83-C-0044, NSF-CHE81-811122

PERSONAL AUTHORS: Seereeram, Devo ; McVay, Michael C. ; Linton, Paul F. ;

PROJECT NO. 2303

CONTRACT NO. AFOSR-84-0108

TASK NO. B2

PROJECT NO. 2307

MONITOR: AFOSR  
TR-85-1008

TASK NO. C1

## UNCLASSIFIED REPORT

MONITOR: AFOSR

TR-85-1023

SUPPLEMENTARY NOTE: Pub. in Organometallics, v4 p828-829 1985.

## UNCLASSIFIED REPORT

ABSTRACT: (U) The synthesis of cis and trans isomers 1,2-bis(trimethylsilyl)amino)-1,2-dimesityldi-silene, 3, is reported. The trans isomer of this compound, 3a, and trans-1,2-di-tert-butyl-1,2-dimesityldisilene, 2a, both undergo photochemical isomerizations when irradiated at 254 or 350 nm giving mixtures enriched in the cis isomers 2b and 3b. These mixtures revert to equilibrium mixtures of trans and cis disilenes which at 25°C in benzene are 2a:2b = 98:2 and 3a:3b = 94:6. Activation energies for thermal cis-trans isomerization in kcal/mol are 31.3 + or - 3.7 for 2 and 25.4 + or - 2.2 for 3.

DESCRIPTORS: (U) \*SILICON COMPOUNDS, \*ORGANIC COMPOUNDS, ACTIVATION ENERGY, BENZENE, EQUILIBRIUM(GENERAL), MIXTURES, SYNTHESIS(CHEMISTRY), PHOTOCHEMICAL REACTIONS, ISOMERIZATION, REPRINTS

IDENTIFIERS: (U) \*Silenes, PE61102F, WUAFOSR230382

AD-A182 350

AD-A182 348

## UNCLASSIFIED

PAGE 94

EVK551

ABSTRACT: (U) This study was an analytical an experimental investigation into the influences of material anisotropy and principal plane rotation on the stress-strain and strength behavior of granular soil (Reid-Bedford Sand). The laboratory investigation entailed the performance of approximately fifteen triaxial tests under conventional compression and extension loading, and five through initial shear, followed by hydrostatic compression. The initial tests with an additional fifteen experiments were used in characterizing the influence of inherent anisotropy and principal plane rotations on material response. The latter were employed to delineate the effects of stress-induced anisotropy. A review of existing elasto-plastic theory as related to soil mechanics showed only a few models of a phenomenological nature which of the multi-surface isotropic/kinematic hardening characterizations, Prevost's pressure sensitive model, was used in the prediction of the hollow cylinder tests. Although the model reasonably reproduced the response along its calibration path, it did not quantitatively or qualitatively predict the laboratory results along other stress paths which involved principal plane rotations. The report concludes with a discussion on the significant

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 348 CONTINUED

influence of anisotropy on the stiffness, strength, and plastic flow rate direction of granular media, and the need for improved analytical representation.

DESCRIPTORS: (U) \*TRIAxIAL STRESSES, \*GRANULES, \*STRESS STRAIN RELATIONS, \*SOIL MECHANICS, CALIBRATION, FLOW RATE, HYDROSTATICS, LABORATORY TESTS, MODELS, PLASTIC FLOW, PRESSURE, SENSITIVITY, COMPRESSION, ANISOTROPY, STIFFNESS, STRENGTH(MECHANICS),

IDENTIFIERS: (U) Reid bedford model

AD-A162 346 20/6 20/5 7/4

ROCKWELL INTERNATIONAL THOUSAND OAKS CA SCIENCE CENTER  
(U) Laser Evaporation Studies.

DESCRIPTIVE NOTE: Rept. no. 1 (Annual) 1 Sep 84-30 Jun 85,

JUL 85 41P

PERSONAL AUTHORS: Sankur, H. ;

REPORT NO. SC5411.2AR

CONTRACT NO. F49620-84-C-0091

PROJECT NO. 2306

TASK NO. B2

MONITOR: AFOSR  
TR-85-0992

UNCLASSIFIED REPORT

ABSTRACT: (U) The use of a pulsed laser to evaporate dielectric materials for optical thin film deposition was investigated. Studies were performed to analyze the species present in the evaporant plume generated by a 1.5 Joule TEA-CO2 laser. The materials investigated were Al2O3, SiO2, ZnO, PbF2, TiO2, and HfO2. Experiments were performed in a cryopumped system with a base pressure of 10 to the 8th power torr. The evaporant plume was characterized using luminescence spectroscopy, mass spectroscopy, and ion current analysis. Luminescence studies indicated the existence of excited state neutrals and singly, doubly and triply ionized species. Plasma electron temperatures of 6500 K were deduced from a study of neutrals in the plumes of SiO2 and Al2O3. Molecular species were found in significant concentrations only for higher (.001 torr) residual gas pressures. Ion current analysis demonstrated the existence of several species for each compound, each with different velocities. Velocities of 15 million cm/sec indicated very high kinetic energies for the ionized species. In the following phase of the program, the effects of excited state and energetic species on thin film growth will be investigated. Keywords: Luminescence; Ambient Gas; Power dependence; Mass spectroscopy; Dielectric materials.

AD-A162 348

AD-A162 346

UNCLASSIFIED

PAGE 95 EVK551

## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 346 CONTINUED

AD-A162 339 21/2 7/4

DESCRIPTORS: (U) \*VAPOR DEPOSITION, \*LASER APPLICATIONS, \*OPTICAL MATERIALS, \*THIN FILMS, TEA LASERS, CARBON DIOXIDE LASERS, ALUMINUM OXIDES, SILICON DIOXIDE, HAFNIUM COMPOUNDS, OXIDES, TITANIUM DIOXIDE, LEAD COMPOUNDS, FLUORIDES, ELECTRON ENERGY, GASES, EXCITATION, IONIZATION, LUMINESCENCE, DIELECTRICS, ENERGETIC PROPERTIES, IONIC CURRENT, EVAPORATION, MASS SPECTROSCOPY, GASES, PRESSURE, KINETIC ENERGY, GROWTH(GENERAL), THIN FILMS

FLORIDA UNIV GAINESVILLE DEPT OF CHEMISTRY

(U) Atomic and Molecular Gas Phase Spectrometry.

DESCRIPTIVE NOTE: Summary rept. 1 Oct 83-30 Sep 85.

OCT 85 40P

PERSONAL AUTHORS: Winefordner, J. D. ;

CONTRACT NO. F49620-84-C-0002

MONITOR: AFOSR  
TR-85-1034

IDENTIFIERS: (U) PEG1102F, WJAFOSR2308B2

## UNCLASSIFIED REPORT

ABSTRACT: (U) The major goals of this research have been to develop diagnostic spectroscopic methods for measuring spatial/temporal temperatures and species of combustion flames and plasmas and to develop sensitive, selective, precise, reliable, rapid spectrometric methods of trace analysis of elements present in jet engine lubricating oils, metallurgical samples, and engine exhausts. The diagnostic approaches have been based upon the measurement of metal probes introduced into the flame or plasmas and the measurement of OH in flames. The measurement approaches have involved the use of laser-excited fluorescence, saturated absorption, polarization, and linear absorption. The spatial resolution in most studies is less than 1 cu mm and the temporal resolution is less than 10 ns with the use of pulsed lasers. Single pulse temperature and species measurements have also been carried out. Other diagnostic studies have involved the measurement of collisional redistribution of radiatively excited levels of Na and Ti in acetylene/O<sub>2</sub>/Ar flames and the measurement of lifetimes and quantum efficiencies of atoms and ions in the inductively coupled plasmas, ICP. The latter studies indicate that the high electron number densities in ICPs are not efficient quenchers of excited atoms/ions. Temperatures of microwave atmospheric plasmas produced capacitatively and cool metastable N<sub>2</sub> discharge produced by a dielectric discharge have also been measured.

DESCRIPTORS: (U) \*MOLECULAR SPECTROSCOPY, \*EXHAUST GASES, \*ATOMIC SPECTROSCOPY, DIAGNOSTIC EQUIPMENT, LASER INDUCED FLUORESCENCE, VAPOR PHASES, COUPLING(INTERACTION).

AD-A162 346

AD-A162 339

## UNCLASSIFIED

PAGE 98

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 339

CONTINUED

PLASMAS(PHYSICS), ATOMS, EXCITATION, IONS, FLAMES,  
EXHAUST SYSTEMS, HIGH DENSITY, ELECTRON DENSITY, JET  
ENGINES, LUBRICATING OILS, ABSORPTION, METALLURGY,  
SAMPLING, PULSED LASERS, SATURATION, RESOLUTION, SPATIAL  
DISTRIBUTION, COMBUSTION, VAPOR PHASES, QUANTUM  
EFFICIENCY, TEMPERATURE

AD-A162 337 13/8 11/2

SRI INTERNATIONAL MENLO PARK CA

(U) Silicon Nitride Joining.

DESCRIPTIVE NOTE: Final rept. 1 Dec 80-30 Jun 85.

OCT 85 75P

PERSONAL AUTHORS: Johnson, Sylvia M. ; Rowcliffe, David J. ;

CONTRACT NO. F49820-81-K-0001

PROJECT NO. 2306

TASK NO. A2

MONITOR: AFOSR  
TR-85-1065

UNCLASSIFIED REPORT

ABSTRACT: (U) The results obtained during the investigation of a method of joining silicon nitride with an oxide glass are described. Joining methods for silicon nitride to ceramics and metals are reviewed in Appendix A. Chemical interactions between Si3N4 and glass are described in Appendix B. Both hot-pressed and a hot-isostatically pressed Si3N4 were used for joining experiments. The vaporization behavior of the materials as determined by mass spectrometry is described. A new method of joining Si3N4 which uses very little glass and which has potential for producing joined pieces which retain their strength to high temperatures was developed and preliminary results are presented. (Author)

DESCRIPTORS: (U) \*SILICON NITRIDES, \*THERMAL JOINING, GLASS, OXIDES, CERAMIC MATERIALS, METALS, VAPORIZATION, IMPURITIES, HOT PRESSING, ISOSTATIC PRESSING, MAGNESIUM OXIDES, YTTRIUM OXIDES, JOINTS, STRENGTH(MECHANICS), HIGH TEMPERATURE, DEGRADATION, MASS SPECTROMETRY

IDENTIFIERS: (U) Oxide glass joints, Densification aids, WUAFOSR2306A2, PE61102F, LPN-SRI-PYU-2527

AD-A162 339

AD-A162 337

UNCLASSIFIED

PAGE 97 EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 336 12/1

BROWN UNIV PROVIDENCE RI DIV OF ENGINEERING

(U) Control and Identification of Time Varying Systems.

DESCRIPTIVE NOTE: Final technical rept. 1 Jul 82-29 Jun 85.

OCT 85 12P

PERSONAL AUTHORS: Pearson, Allan E. ;

CONTRACT NO. AFOSR-82-0230

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-85-1086

UNCLASSIFIED REPORT

Availability: Document partially illegible.

ABSTRACT: (U) Research is summarized on a finite dimensional approach to the feedback stabilization of state delayed control systems via the use of a reducing transformation. Research is described in the parameter identification of time lag systems using a variable projection functional to decouple the estimation of the delay parameters from the remaining system parameters. Research is also described in the use of Fourier based modulating functions for identifying linear, bilinear and polynomial input-output differential systems. Keywords: Feedback Stabilization of Time Lag Systems; Time Delay Estimation in Received Signals; Identification of Linear; Bilinear and Polynomial Input-Output Differential Systems.

DESCRIPTORS: (U) \*TIME LAG THEORY, DELAY, ESTIMATES, FEEDBACK, FOURIER ANALYSIS, FUNCTIONS, IDENTIFICATION, MODULATION, PARAMETERS, STABILIZATION, VARIABLES, CONTROL SYSTEMS, NONLINEAR SYSTEMS, DIFFERENTIAL EQUATIONS, SIGNAL PROCESSING, INPUT OUTPUT DEVICES

IDENTIFIERS: (U) PE81102F. WUAFOSR2304A1

AD-A162 336

UNCLASSIFIED

AD-A162 335 4/1 20/14 17/9 20/4

GOULD DEFENSE SYSTEMS INC MIDDLETOWN RI OCEAN DEFENSE DIV

(U) The Turbulent Gravity Wave-Critical Level Encounter in the Evolution of Atmospheric Flow.

DESCRIPTIVE NOTE: Final rept..

JUN 85 32P

PERSONAL AUTHORS: Grant, John R. ;

REPORT NO. OSD-771-HYDR0-CR-85-03

CONTRACT NO. F49620-84-C-0048

PROJECT NO. 2310

TASK NO. A1

MONITOR: AFOSR  
TR-85-1008

UNCLASSIFIED REPORT

Availability: Document partially illegible.

ABSTRACT: (U) The extended objective of this work is to contribute to understanding the short term response of the atmosphere to short term influences. The particular influence studied is internal gravity wave motion, specifically the encounter of a gravity wave with a critical level, a height where the component of the wind speed in the direction of the horizontal phase propagation matches the horizontal component of wave phase speed. Two major effects of such encounters are the deposition in the wind of momentum transported by the wave motion and the generation of turbulence by the wave motion. Both phenomena modify the wind in the vicinity of the critical level. Several nonturbulent and turbulent calculations of a gravity wave-critical level encounter were performed. The simulated signatures will aid in the examination of interpretation of the records of the Poker Flats and Sunset doppler radars. Of those events which can be identified as critical level encounters, one or two will be selected for numerical simulation, for which key parameters are matched to those extracted from the observations.

AD-A162 335

PAGE 98 EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 335 CONTINUED

AD-A162 334 20/4 12/1

BOEING COMMERCIAL AIRPLANE CO SEATTLE WA

DESCRIPTORS: (U) \*ATMOSPHERIC MOTION, \*GRAVITY WAVES, \*DOPPLER RADAR, ELECTROMAGNETIC WAVE PROPAGATION, ATMOSPHERE MODELS, TURBULENCE, SHORT RANGE(TIME), WIND VELOCITY, MOMENTUM, INTERACTIONS, INTERNAL WAVES, ALTITUDE, CRITICALITY(GENERAL), DIGITAL SIMULATION

(U) Coupling Linearized Far-Field Boundary Conditions with Nonlinear Near-Field Solutions in Transonic Flow.

DESCRIPTIVE NOTE: Annual rept. 1 Jul 83-1 Feb 85.

IDENTIFIERS: (U) Cray-1 computers, Turbulent gravity waves, PEG1102F, WUAFOSR2310A1

FEB 85 82P

PERSONAL AUTHORS: Rowe, William S. ; Ehlers, F. E. ;

REPORT NO. D8-52885

CONTRACT NO. F49620-83-C-0118

PROJECT NO. 2302

TASK NO. B1

MONITOR: AFOSR  
TR-85-1082

UNCLASSIFIED REPORT

ABSTRACT: (U) This investigation evaluated the feasibility of coupling linearized far-field finite differencing equations to reduce the size of grid networks required in present transonic flow calculations. A procedural change to an existing finite differencing program involved distributing sources on the solution interface boundary in order to develop the proper far-field outgoing wave boundary condition on a reduced size grid network. Validation of the modification procedure was established for zero thickness airfoils by comparing predicted two-dimensional results with results obtained from an exact procedure. A criterion based on the gradient of the flow field Mach number was developed for use in establishing the minimum size grid network necessary for accurate finite thickness unsteady loading predictions. Acceptable loading predictions were achieved for a nominal 5:1 gridsize reduction ratio with a 40% reduction in computer usage costs. Keywords: Unsteady flow; Transonic flow, Oscillating airfoils.

DESCRIPTORS: (U) \*TRANSONIC FLOW, COSTS, FLOW FIELDS, MACH NUMBER, GRIDS, NETWORKS, NEAR FIELD, NONLINEAR SYSTEMS, SOLUTIONS(GENERAL), RATIOS, REDUCTION, BOUNDARIES, FAR FIELD, WAVES, PREDICTIONS, REDUCTION.

AD-A162 335

AD-A162 334

UNCLASSIFIED

PAGE 99 EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 334 CONTINUED

AD-A162 333 12/1

SIZES(DIMENSIONS), INTERFACES, SOLUTIONS(GENERAL), COMPUTATIONS, AIRFOILS, OSCILLATION, TRANSONIC FLOW, VALIDATION, UNSTEADY FLOW, COUPLING(INTERACTION), FINITE DIFFERENCE THEORY, MATHEMATICAL PREDICTION, TWO DIMENSIONAL, GRADIENTS, LOAD DISTRIBUTION, COMPUTERIZED SIMULATION, WAKE, LIFTING SURFACES, THREE DIMENSIONAL

BROWN UNIV PROVIDENCE RI LEFSCHETZ CENTER FOR DYNAMICAL SYSTEMS

(U) Asymptotic Global Behavior for Stochastic Approximations and Diffusions with Slowly Decreasing Noise Effects: Global Minimization via Monte Carlo.

IDENTIFIERS: (U) Shock loads, OPTTRAN computer programs, Unsteady loading, PE81102F, WJAFOSR2302B1

DESCRIPTIVE NOTE: Interim rept.,

APR 85 42P

PERSONAL AUTHORS: Kushner, H. J. ;

CONTRACT NO. DAAG29-84-K-0082, N00014-84-C-0577

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-85-1022

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Sponsored in part by Grant, AFOSR-81-0118.

ABSTRACT: (U) This document studies the asymptotic behavior of a system involving a sequence of random variables. Keywords: Monte Carlo method; stochastic approximation; algorithms; annealing.

DESCRIPTORS: (U) \*ASYMPTOTIC SERIES, \*RANDOM VARIABLES, APPROXIMATION(MATHEMATICS), GLOBAL, MONTE CARLO METHOD, ALGORITHMS, ANNEALING, NOISE, STOCHASTIC PROCESSES

AD-A162 334

AD-A162 333

UNCLASSIFIED

PAGE 100

EVK551



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 332 CONTINUED

CALIFORNIA UNIV LOS ANGELES GRADUATE SCHOOL OF  
MANAGEMENT

IDENTIFIERS: (U) WJAFOSR2304A5, PE61102F

(U) Sequential Decision Models in Reliability.

DESCRIPTIVE NOTE: Final rept. 1 Oct 82-30 Sep 85,

OCT 85 7P

PERSONAL AUTHORS: Miller, Bruce L. ;

CONTRACT NO. AFOSR-82-0305

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-85-1093

UNCLASSIFIED REPORT

ABSTRACT: (U) The research topics under this grant included optimal stockage policies for parts which replaced failed components, optimal inspection policies, quality control, and queuing theory applications to inventory. The common thread of this research is the sequential or dynamic aspect of reliability problems. This dynamic aspect showed up in various ways: What order to examine components of a failed part. What ordering rules to use for the failed parts, taking into account that it is possible to order again later in the future. The mathematical technique applied to the above problems was dynamic programming. When we shifted attention to quality control and the production of components, the dynamic aspect of the problem was still paramount. Now the question was to determine the quality level of a production process using past quality data. The mathematical technique applied to this problem was time series. We have also considered the related decision problem of when the production process should be corrected.

DESCRIPTORS: (U) \*QUALITY CONTROL, \*DYNAMIC PROGRAMMING, QUEUEING THEORY, INVENTORY, INSPECTION, OPTIMIZATION, POLICIES, PARTS, PRODUCTION, DECISION THEORY, DECISION MAKING, MATHEMATICS, PRODUCTION, RELIABILITY, MATHEMATICAL MODELS, SEQUENCES, TIME SERIES ANALYSIS

AD-A162 332

AD-A162 332

UNCLASSIFIED

PAGE 101

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 326 20/12 7/4

AD-A162 326 CONTINUED

MASSACHUSETTS INST OF TECH CAMBRIDGE

(U) Structure-Property Relationships in Intercalated Graphite.

DESCRIPTIVE NOTE: Semi-annual rept. 1 Oct 84-31 Mar 85.

JUL 85 22P

PERSONAL AUTHORS: Dresselhaus, Mildred S. ; Dresselhaus, Gene ;

CONTRACT NO. F49620-83-C-0011

PROJECT NO. 2308

TASK NO. C3

MONITOR: AFOSR  
TR-85-0895

UNCLASSIFIED REPORT

ABSTRACT: (U) Experimental and theoretical studies have been carried out relevant to the structural, lattice electronic, magnetic and superconducting properties of synthetic metals prepared by intercalating graphite. New synthesis methods have been developed for preparing magnetic transition metal chloride and potassium-hydrogen graphite intercalation compounds. The use of ion implantation to enhance intercalation has been explored and promising results have been obtained. Structural studies using high resolution x-ray scattering and transmission electron microscopy have been applied to study two-dimensional structural phase transitions such as the commensurate to incommensurate stripe phase transition in bromine intercalated graphite and commensurate to glass phase transition in antimony pentachloride intercalated graphite. The construction of a Raman microprobe allows study of the spatial homogeneity (to 2 micron resolution) of the staging in specific intercalated graphite samples. The high field magnetoresistance anomaly in graphite identified with a charge density wave has been further explored with particular emphasis given to the role of impurities in pair breaking phenomena and pulsed electric fields in non-linear non-ohmic effects. The theoretical model developed to explain the superconducting behavior in the first

AD-A162 326

UNCLASSIFIED

PAGE 102

EVK551

stage alkali metal compounds has guided studies on superconducting graphite intercalation compounds with higher transition temperatures with particular relevance to their superconducting behavior and their related Fermi surface and phonon mode properties. (Author)

DESCRIPTORS: (U) \*GRAPHITE, \*SUPERCONDUCTORS, \*PHASE TRANSFORMATIONS, ANOMALIES, ANTIMONY, BROMINE, CHARGE DENSITY, CHLORIDES, ELECTRIC FIELDS, ELECTRON MICROSCOPY, FERMION SURFACES, GLASS, GRAPHITED MATERIALS, HIGH RESOLUTION, HIGH TEMPERATURE, HOMOGENEITY, HYDROGEN COMPOUNDS, IMPURITIES, INTERACTIONS, ION IMPLANTATION, LAYERS, MAGNETORESISTANCE, METALS, MICROPROBES, MODELS, MOLECULAR STRUCTURE, PHONONS, PHYSICAL PROPERTIES, POTASSIUM COMPOUNDS, PULSES, RAMAN SPECTRA, SAMPLING, SPATIAL DISTRIBUTION, STRUCTURAL PROPERTIES, SUPERCONDUCTIVITY, SYNTHESIS, SYNTHETIC MATERIALS, THEORY, TRANSITION TEMPERATURE, TRANSITIONS, TRANSMITTANCE, TWO DIMENSIONAL, WAVES, X RAY SCATTERING, ELECTRONIC STATES, MAGNETIC PROPERTIES, THERMAL PROPERTIES, TRANSPORT PROPERTIES, ELECTRICAL CONDUCTIVITY, ALKALI METAL COMPOUNDS

IDENTIFIERS: (U) \*Intercalated graphite, \*Intercalation compounds, Thermal transport, Superconducting graphite, WUAF0SR2308C3, PE81102F

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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 314 12/1

AD-A162 314 CONTINUED

DUKE UNIV DURHAM NC DEPT OF COMPUTER SCIENCE

(U) Transient Solution of Acyclic Markov Chains.

DESCRIPTIVE NOTE: Technical rept.,

AUG 85 81P

PERSONAL AUTHORS: Marie, Raymond ; Reibman, Andrew ; Trivedi, Kishor ;

REPORT NO. CS-1984-23

CONTRACT NO. AFOSR-84-0132

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-85-0981

UNCLASSIFIED REPORT

ABSTRACT: (U) Continuous time Markov chains are commonly used in system reliability modeling. Increasing system complexity and non-Markovian behavior can drastically increase the size of a Markov model's state space. Special approximation techniques and numerical methods have been introduced to reduce the resources needed to solve Markov chain models. This paper discusses a method for automatically deriving exact transient solutions of Markov chains. The solutions derived are symbolic in t. The authors' approach can also provide solutions that are symbolic in other parameters. They extend our method to include parametric sensitivity analysis of the transient solution, and to provide cumulative measures of Markov chain behavior. They present three examples, one to show the use of our method in evaluating approximate solution techniques, one showing parametric sensitivity analysis of a large Markov model, and one demonstrating the computation of cumulative measures for an acyclic Markov reward processes. (Author)

DESCRIPTORS: (U) \*MARKOV PROCESSES, \*SYMBOLIC PROGRAMMING, MATHEMATICAL MODELS, NUMERICAL METHODS AND PROCEDURES, PARAMETRIC ANALYSIS, RELIABILITY, SOLUTIONS(GENERAL), TRANSIENTS

AD-A162 314

AD-A162 314

UNCLASSIFIED

PAGE 103 EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 311 11/4 13/13

AD-A162 311 CONTINUED

FLORIDA UNIV GAINESVILLE DEPT OF ENGINEERING SCIENCES

INTERFACIAL TENSION, SHEAR STRESSES, REPRINTS

(U) Internal Damping of Short-Fiber Reinforced Polymer Matrix Composites.

IDENTIFIERS: (U) PE81102F, WJAFOSR2303A3

85

9P

PERSONAL AUTHORS: Sun, C. T. ; Chaturvedi, S. K. ; Gibson, R. F. ;

CONTRACT NO. AFOSR-83-0154

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-85-0898

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Computers and Structures, v20  
n1-3 p391-400, 1985.

ABSTRACT: (U) This paper describes an analytical study to optimize the internal damping of short-fiber polymer matrix composites. Two different analytical methods--force balance model and finite-element numerical scheme--were used to obtain numerical results. The loss factor is optimized in terms of many important parameters such as; fiber aspect ratio, the angle theta between the applied tensile load and the fiber direction, stiffness ratio between the fiber and matrix materials. The numerical results show that, for given and matrix materials and given fiber volume fraction, there exists an optimum fiber aspect ratio and an optimum angle theta for maximum damping of the composite. The predicted optimum aspect ratios lie in the range of actual aspect ratios for whiskers and microfibers for small fiber damping and increases as the damping ratio between the fiber and matrix increases. The predicted optimum angle theta lies between 0 and 30 degs.

DESCRIPTORS: (U) \*FIBER REINFORCED COMPOSITES, \*COMPOSITE STRUCTURES, \*MATRIX MATERIALS, \*POLYMERS, TENSILE PROPERTIES, DAMPING, RATIOS, FIBERS, FINITE ELEMENT ANALYSIS, NUMERICAL ANALYSIS, LOSSES, ASPECT RATIO, OPTIMIZATION, INTERNAL, ANGLES, STIFFNESS,

AD-A162 311

AD-A162 311

UNCLASSIFIED

PAGE 104

EVK551

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 310 7/2 7/4

AD-A162 303 20/5 7/4

COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY

CITY COLL NEW YORK INST FOR ULTRAFAST SPECTROSCOPY AND LASERS

(U) The Role of Intersystem Crossing Steps in Singlet Oxygen Chemistry and Photo-Oxidations.

DESCRIPTIVE NOTE: Rept. for 1980-1985,

85 11P

DESCRIPTIVE NOTE: Final rept. 1981-1984,

NOV 84 19P

PERSONAL AUTHORS: Turro, Nicholas J. ;

PERSONAL AUTHORS: Alfano, Robert R. ; Doukas, Apostolos G. ;

CONTRACT NO. AFOSR-84-0040

CONTRACT NO. F49620-83-C-0027

PROJECT NO. 2303

PROJECT NO. 2305

TASK NO. B2

TASK NO. C1

MONITOR: AFOSR  
TR-85-1004MONITOR: AFOSR  
TR-85-0997

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Tetrahedron, v41 n11 p2089-2088 1985.

ABSTRACT: (U) Singlet oxygen chemistry and photo-oxidation reactions, in general, often require one or more critical reaction steps that involve an intersystem crossing from a singlet state to a triplet state or vice versa. This paper considers two important intersystem crossing mechanisms, electron spin-electron (spin orbit) coupling and electron spin-nuclear spin (spin-spin) coupling, and how they may be involved: (1) in the deactivation of singlet oxygen to triplet oxygen; (2) in the thermal catalytic conversion of triplet to singlet oxygen; and (3) in the fragmentation of aromatic endoperoxides to yield O<sub>2</sub> and an aromatic substrate.

DESCRIPTORS: (U) \*PHOTOCHEMICAL REACTIONS, \*OXIDATION, \*OXYGEN, AROMATIC COMPOUNDS, CATALYTIC CRACKING, CHEMISTRY, CROSSINGS, DEACTIVATION, ENERGY CONVERSION, FRAGMENTATION, HEAT, ORBITS, RESPONSE, SPINNING(MOTION), SUBSTRATES, MAGNETIC PROPERTIES, ISOTOPES, REPRINTS

IDENTIFIERS: (U) PE81102F, WUAFOSR2303B2

AD-A162 310

AD-A162 303

## UNCLASSIFIED

PAGE 105

EVK551

ABSTRACT: (U) The main areas of research are: development of picosecond and subpicosecond laser sources and the application of time-resolved spectroscopy to the study of semiconductors. In the subpicosecond laser development we have developed a stable and reliable laser system oscillator and amplifier. We have achieved over 95% conversion efficiency in ultrafast white light laser source. In addition, we have also achieved laser action in emerald. In the semiconductor research program, we have identified the deep native defects in undoped semi-insulating Cadmium Selenide and have studied the transient dynamics via deep defects and the enhancement of four-wave processes by deep trapping levels. We have studied the spontaneous and stimulated emission spectra and dynamic processes of Gallium Indium Phosphide and GaInP alloys, and characterized the exciton, bound magnetic polarons, and impurity fluorescence bands in alloys of Cadmium manganese Selenide. In addition, we have initiated a research program on the dynamic processes of quantum wells and superlattices.

DESCRIPTORS: (U) \*SEMICONDUCTOR LASERS, \*ABSORPTION, \*FLUORESCENCE, \*RAMAN SPECTROSCOPY, SHORT PULSES, PULSED LASERS, LASER AMPLIFIERS, MANGANESE COMPOUNDS, ENERGY BANDS, DEFECTS(MATERIALS), TRAPPING(CHARGED PARTICLES).

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A182 303 CONTINUED

AD-A182 301 19/1

BERYL, GEMS(MINERALS), GALLIUM PHOSPHIDES, INDIUM PHOSPHIDES, ALLOYS, CADMIUM SELENIDES, IMPURITIES, QUANTUM ELECTRONICS, OSCILLATORS, RELIABILITY, INSULATION, EMISSION SPECTRA, STIMULATION(GENERAL)

MCGILL UNIV MONTREAL (QUEBEC)

(U) Requirements for Initiation and Sustained Propagation of Fuel-Air Explosives.

IDENTIFIERS: (U) Quantum wells, Superlattices, Picosecond time, Four wave mixing, Polarons, PE81102F, WJAFOSR2305C1

DESCRIPTIVE NOTE: Final rept. 1 May 82-30 Apr 83.

JUN 83 118P

PERSONAL AUTHORS: Knystautas, R. ; Lee, J. H. ;

CONTRACT NO. AFOSR-82-0178

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-85-1100

UNCLASSIFIED REPORT

ABSTRACT: (U) CONTENTS: Requirements for Initiation and Sustained Propagation of Fuel-air Explosives; Measurements of Cell Size in Hydrocarbon-air Mixtures and Predictions of Critical Tube Diameter, Critical Initiation Energy, and Detonability Limits; Effect of Geometry on the Transmission of Detonation through an Orifice; Large-Scale Experiments on the Transmission of Fuel-air Detonations from Two-Dimensional Channels; Diffraction of Detonation from Tubes into a Large Fuel-air Explosive cloud; Dynamic Parameters of Gaseous Detonations; High-speed Turbulent Deflagrations and Transition to Detonation in H<sub>2</sub>-Air Mixtures. Keywords: Reprints.

DESCRIPTORS: (U) \*FUEL AIR EXPLOSIVES, AIR, CELLS, CHANNELS, CLOUDS, DETONATIONS, DIAMETERS, DIFFRACTION, DYNAMICS, GASES, HYDROCARBONS, MIXTURES, PARAMETERS, PROPAGATION, REPRINTS, SIZES(DIMENSIONS), TRANSITIONS, TUBES, TWO DIMENSIONAL

IDENTIFIERS: (U) PE81102F, WJAFOSR2308A2

AD-A182 303

AD-A182 301

UNCLASSIFIED

PAGE 108

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 300 9/1 18/8

AD-A162 300 CONTINUED

ITT AEROSPACE/OPTICAL DIV FORT WAYNE IND

VULNERABILITY, AVALANCHE EFFECT(ELECTRONICS), SCHOTTKY  
BARRIER DEVICES

(U) Study in Spurious Sensitivity of Electronics in Space.

DESCRIPTIVE NOTE: Final rept. Jan-Aug 84.  
IDENTIFIERS: (U) Proton irradiation, Image dissector  
tubes, PE81102F, WUAF0SR2301A7

AUG 85 61P

PERSONAL AUTHORS: Yeager, David M. ;

CONTRACT NO. F49620-83-C-0153

PROJECT NO. 2301

TASK NO. A7

MONITOR: AFOSR  
TR-85-0983

UNCLASSIFIED REPORT

ABSTRACT: (U) The results of an experimental investigation into the interaction of protons,  $E = 318$  MeV and 132 MeV, with selected multiplier phototubes and silicon photodiodes are presented. The devices were chosen because of their spaceborne applications and previous gamma ray, electron, and lower energy proton measurements. The energies are representative of those expected of particle beam weapons. A discussion of the operation of each device and its expected response to protons is presented. Testing at Los Alamos Meson Physics Facility demonstrated the temporal response of multiplier phototubes to be nanoseconds but requires microseconds for decay. Another test at the Harvard Cyclotron Lab. determined the transient response of these sensors to 132 MeV protons in the range of 100,000 to  $2 \times 10^6$  to the 8th power P/sq cm sec. The response was very nearly linear, but was slightly less for most devices. The radiation sensitivity of each device was calculated as expected. The multiplier phototubes were the least sensitive.  
(Author)

DESCRIPTORS: (U) \*PHOTOMULTIPLIER TUBES, \*PHOTODIODES, PROTONS, RADIATION DAMAGE, SILICON, PHOTOTUBES, SENSITIVITY, PARTICLE BEAM WEAPONS, PROTON BEAMS, TRANSIENTS, PULSES, IRRADIATION, IMAGE DISSECTION, DECAY, TIME, TRACKING, TARGET ACQUISITION, SIGNAL TO NOISE RATIO, ELECTROOPTICS, OPTICAL DETECTORS, SPACEBORNE,

AD-A162 300

AD-A162 300

UNCLASSIFIED

PAGE 107

EVK551

## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 298 12/1

AD-A162 297 7/4

FLORIDA STATE UNIV TALLAHASSEE DEPT OF STATISTICS

TEXAS UNIV AT AUSTIN DEPT OF CHEMISTRY

(U) Measures of Dependence.

(U) Can Desolvation of an Ion Be the Rate-Determining Step in a Reaction?

84 12P

85 5P

PERSONAL AUTHORS: Joag-Dev, Kumar ;

PERSONAL AUTHORS: Dewar, Michael J. S. ; Storch, Donn M. ;

CONTRACT NO. F49620-82-K-0007, AFOSR-81-0038

CONTRACT NO. F49620-83-C-0024

PROJECT NO. 2304

PROJECT NO. 2303

TASK NO. A5

TASK NO. B2

MONITOR: AFOSR  
TR-85-1015MONITOR: AFOSR  
TR-85-1009

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Handbook of Statistics, v4  
p79-88 1984.SUPPLEMENTARY NOTE: Pub. in the Jnl. of the Chemical  
Society, Chemical Communications, p93-96 1985.

ABSTRACT: (U) Stochastic dependence between random measurements is one of the important aspects of many statistical investigations. The quantification of this concept for the bivariate distribution is attempted with two entirely different, and in fact, opposing viewpoints. The viewpoint which we will consider first, is concerned with concordance of the pairs. The other perspective is related to the utilization of dependence for the purpose predicting one variable from the other. In this article the discussion is limited only to the bivariate distributions. Also, the measures of association which are mainly used in the categorical data analysis will not be dealt here. In order to strip the discussion of some (non-essential) technical terms, throughout it will be assumed that the moments, derivatives etc. in the assertions will exist. All the functions will be measurable, and unless specified otherwise all the distributions will be absolutely continuous.

ABSTRACT: (U) Recent work suggests that certain reactions of anions with neutral molecules that require activation in solution lead exothermically and without activation to adducts in the gas phase, implying that the activation barriers in solution are due entirely to the energy needed to desolvate the anion and explaining differences from 'normal' reactions where the activation barriers are intrinsic. Keywords: Reprints; Chemical reactions. (Author)

DESCRIPTORS: (U) \*STATISTICAL ANALYSIS, BIVARIATE ANALYSIS, DATA PROCESSING, DISTRIBUTION, MEASUREMENT, MOMENTS, STATISTICS, STOCHASTIC PROCESSES, UTILIZATION, VARIABLES

DESCRIPTORS: (U) \*ANIONS, \*CHEMICAL REACTIONS, ACTIVATION, BARRIERS, MOLECULES, NEUTRAL, REPRINTS, VAPOR PHASES, EXOTHERMIC REACTIONS, SOLVATION

IDENTIFIERS: (U) PE81102F, WUAFOSR230382

IDENTIFIERS: (U) \*DEPENDENCE, PE81102F, WUAFOSR2304A5

AD-A162 298

AD-A162 297

UNCLASSIFIED

PAGE 108

EVK551



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 289

11/6

RHODE ISLAND UNIV KINGSTON PASTORE CHEMICAL LAB

(U) Role of Interfaces in Deformation and Strengthening.  
DESCRIPTIVE NOTE: Final rept. 5-9 Aug 85,

SEP 85 21P

PERSONAL AUTHORS: Nix, William D. ; Cruickshank, Alexander M.

CONTRACT NO. AFOSR-85-0219

PROJECT NO. 2308

TASK NO. A1

MONITOR: AFOSR  
TR-85-1035

UNCLASSIFIED REPORT

ABSTRACT: (U) The primary purpose of the conference concerned the mechanical properties of finely structured materials with interest in the structure and properties of interfaces. Many of the participants indicated that they had developed new ideas which they intended to pursue in the coming months. Keywords: Physical Metallurgy; Deformation; Strengthening.

DESCRIPTORS: (U) \*GRAIN BOUNDARIES, DEFORMATION, INTERFACES, MATERIALS, MECHANICAL PROPERTIES, PHYSICAL METALLURGY, DISLOCATIONS, STRENGTH(MECHANICS), SYMPOSIA

IDENTIFIERS: (U) Strengthening(Metallurgy),  
WUAFOSR2308A1, PE61102F

AD-A162 289

AD-A162 288 9/2 12/1

PITTSBURGH UNIV PA DEPT OF INDUSTRIAL ENGINEERING

(U) The Application of Generalized Geometric Programming (Conjugate Duality) to the Analysis and Solution of Convex Programs.

DESCRIPTIVE NOTE: Final technical rept. 18 Jul 83-15 Jul 85.

JUL 85 10P

PERSONAL AUTHORS: Jefferson, Thomas R. ;

CONTRACT NO. AFOSR-83-0234

PROJECT NO. 2304

TASK NO. A8

MONITOR: AFOSR  
TR-85-1055

UNCLASSIFIED REPORT

ABSTRACT: (U) The research in this grant involves the application of generalized geometric programming (conjugate duality) to a variety of problems. The duality theory constructs a dual program which can provide insight into the problem and assist in solution. Composite geometric programming was developed as an important new class of mathematical programming was developed as an important new class of mathematical programs. Applications studied included machining economics, resource allocation, assignment, nonlinear multicommodity network flow problems, mineral processing, statistical analysis of ordinal categorical data, and estimation. Geometric programming was extended from functions of posynomial form to functions which include exponential, logarithmic and other factors by the development of composite geometric programming. This class retains the power of geometric programming while addressing new problems. Certain machining economics problems and chemical equilibrium problems fall into this new class of mathematical programs. Research on the machining economics problem resulted in the problem being reduced from a nonlinear program to a one-dimensional search. In addition, duality theory provided easy parametric analysis.

AD-A162 288

UNCLASSIFIED

PAGE 109 EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 288 CONTINUED

AD-A162 287 11/8

AUBURN UNIV AL DEPT OF MECHANICAL ENGINEERING

DESCRIPTORS: (U) \*MATHEMATICAL PROGRAMMING, CHEMICAL  
EQUILIBRIUM, THEORY, ECONOMICS, MACHINING, NONLINEAR  
SYSTEMS, GEOMETRY, MINERALS, PROCESSING, ONE DIMENSIONAL,  
SEARCHING, PARAMETRIC ANALYSIS, CONVEX BODIES,  
SOLUTIONS(GENERAL), ALLOCATIONS, RESOURCE MANAGEMENT,  
STATISTICAL ANALYSIS

(U) Ordered Carbon - Metal Alloys for Extraterrestrial  
Power Systems.

DESCRIPTIVE NOTE: Annual rept. Jun 84-Jun 85.

AUG 85 37P

IDENTIFIERS: (U) \*Geometric programming. WJAFOSR2304A8,  
PE81102F

PERSONAL AUTHORS: Chin, Bryan A. ; Madsen, N. H. ; Yeh, K. C. ;  
Gillis, P. F. ;

CONTRACT NO. AFOSR-83-0188

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-85-1041

UNCLASSIFIED REPORT

ABSTRACT: (U) The objective of this research is to  
investigate a new class of material composed of 30-60  
atomic percent (C-Ti) for ultrahigh temperature  
applications in space power systems. The alloy system  
under investigation exhibits melting temperatures in  
excess of 2500 degrees C and form long range ordered  
structures which are expected to yield materials with  
exceptional high temperature strength and resistance to  
environmental degradation. (Mechanical Properties).  
(Author)

DESCRIPTORS: (U) \*HEAT RESISTANT ALLOYS, \*CARBON ALLOYS,  
\*TITANIUM ALLOYS, \*HIGH STRENGTH ALLOYS, HIGH STRENGTH,  
HIGH TEMPERATURE, MELTING, SPACE SYSTEMS, MATERIALS,  
YIELD, SPACE ENVIRONMENTS, MECHANICAL PROPERTIES,  
DEGRADATION, RESISTANCE, TEMPERATURE, POWER SUPPLIES

IDENTIFIERS: (U) WJAFOSR2308A2, PE81102F

AD-A162 288

AD-A162 287

UNCLASSIFIED

PAGE 110 EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 278

7/4

OKLAHOMA STATE UNIV STILLWATER DEPT OF CHEMISTRY

(U) Monte Carlo Random Walk Study of Recombination and Desorption of Hydrogen on Si(111).

AUG 85 13P

PERSONAL AUTHORS: MoorBatcha, I. ; Raff, Lionel M. ; Thompson, Donald L. ;

CONTRACT NO. AFOSR-82-0311

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR  
TR-85-1029

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v83  
n3 p1382-1391, 1 Aug 85.

ABSTRACT: (U) The recombination/desorption of H<sub>2</sub> and the desorption of hydrogen atoms from a Si(111) surface have been investigated using Monte Carlo transition-state theory methods with a biased random walk. Rate coefficients, activation energies, preexponential factors, and angular desorption distributions have been computed for both reaction channels. The distribution of polarization angles for the H<sub>2</sub> rotational angular momentum vector is also reported. The potential-energy surface is expressed as the sum of a lattice potential, a lattice-adatom interaction term, and an adatom-adatom interaction. Keating's formulation as given by Weber is used for the lattice potential. A pairwise sum of 60 Morse potentials represents the adatom-lattice term. The adatom-adatom interaction is a Morse function multiplied by a hyperbolic switching function. The potential parameters are adjusted to fit the theoretical data for the Si(111)-H interaction potential and the measured adsorption energy of H<sub>2</sub> on Si(111). The surface predicts a barrier of 0.81 eV for H<sub>2</sub> adsorption energy of H<sub>2</sub>\* precursor state in the recombination/desorption process. Thermal desorption of hydrogen atoms is predicted to be slow to be an observable process. The computed activation energies are in good agreement with the experimental data.

AD-A162 278

UNCLASSIFIED

AD-A162 278

PAGE 111

EVK551

The calculated preexponential factor for H<sub>2</sub> recombination/desorption is a factor of 1000 smaller than the measured results. A detailed treatment of a reaction mechanism involving an H<sub>2</sub>\* precursor intermediate indicates that this difference is due to differences in the surface coverage present in the calculations and in the experiments. (Reprints)

DESCRIPTORS: (U) \*DESORPTION, \*HYDROGEN, \*SURFACE CHEMISTRY, \*RECOMBINATION REACTIONS, ACTIVATION ENERGY, ANGLES, DESORPTION, DISTRIBUTION, ENERGY, ACTIVATION ENERGY, ANGLES, POLARIZATION, HYDROGEN, MONTE CARLO METHOD, SILICON, ADATOMS, STOCHASTIC PROCESSES, THERMAL RADIATION, REPRINTS

IDENTIFIERS: (U) \*Random walk, Morse function, PE81102F, WUAFOSR230383

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 277 12/1

AD-A162 272 9/3

TECHNION RESEARCH AND DEVELOPMENT FOUNDATION LTD HAIFA  
(ISRAEL)

STANFORD UNIV CA INFORMATION SYSTEMS LAB

(U) Theory and Applications of Random Fields.

(U) Optical Computing Research.

DESCRIPTIVE NOTE: Final rept. 1 May 84-30 Sep 85,

DESCRIPTIVE NOTE: Annual rept. 18 May 84-17 May 85,

OCT 85 18P

JUN 85 124P

PERSONAL AUTHORS: Adler, Robert J. ;

PERSONAL AUTHORS: Goodman, Joseph W. ; Kostuk, Raymond ;  
Ochoa, Ellen ; Cylmer, Bradley ;

CONTRACT NO. AFOSR-84-0104

REPORT NO. ISL-L722-10

PROJECT NO. 2304

CONTRACT NO. AFOSR-83-0168

TASK NO. A5

MONITOR: AFOSR  
TR-85-1037

MONITOR: AFOSR  
TR-85-0987

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The main results described in this report include: (1) A discussion of rough surfaces and their modelling by chi-squared processes and fields. Results which describe how the theory of the latter differs from the Gaussian theory; (2) A development of a new methodology for determining deviation from normality in process and field data; (3) New results on the distribution of the maxima of general Gaussian processes; and (4) Development of a new representation of generalized Gaussian fields and those fields subordinated to it via central limit theorems for additive functionals of Markov processes.

DESCRIPTORS: (U) \*GAUSSIAN QUADRATURE, LIMITATIONS, MARKOV PROCESSES, METHODOLOGY, NORMALITY SURFACE ROUGHNESS, THEOREMS, CHI SQUARE TEST, MATHEMATICAL MODELS

IDENTIFIERS: (U) \*Random fields, PE81102F, WJAFOSR2304A5

AD-A162 277

AD-A162 272

UNCLASSIFIED

PAGE 112

EVK551

ABSTRACT: (U) This document contains information on the research accomplished under AFOSR Grant No. AFOSR 83-0168 during the time period 18 May 1984 through 17 May 1985. The work covers several different areas of optical computing and related topics. The primary emphasis of the work is on applications of optics to interconnections in the area of microelectronics. A second area of investigations is the inversion of images and wavefronts using photorefractive crystals, and the applications of such nonlinear operations to spatial filtering problems. Work has also been completed on the wavefront inversion using holograms and on the suppression of speckle in coherently formed images. Publications during the last year arising out of the grant are also detailed. (Author)

DESCRIPTORS: (U) \*MICROOPTICAL CIRCUITS, \*COMPUTER APPLICATIONS, OPTICAL IMAGES, MICROELECTRONICS, HOLOGRAMS, NONLINEAR SYSTEMS, OPERATION, SPECULAR REFLECTION, SUPPRESSION, OPTICAL PROPERTIES, INVERSION, OPTICAL ANALYSIS, SPATIAL FILTERING, INVERSION, WAVEFRONTS

IDENTIFIERS: (U) Photorefractive materials, PE81102F

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 271 12/1 AD-A162 271 CONTINUED

BROWN UNIV PROVIDENCE RI LEFSCHETZ CENTER FOR DYNAMICAL SYSTEMS

(U) Nearly Optimal State Feedback Controls for Stochastic Systems with Wideband Noise Disturbances.

DESCRIPTIVE NOTE: Interim rept.,

JUL 85 42P

PERSONAL AUTHORS: Kushner, Harold J. ; Runggaldier, W. ;

REPORT NO. LCDS-85-23

CONTRACT NO. DAAG29-84-K-0082, AFOSR-81-0118

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-85-1054

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Sponsored in part by Contract N00014-83-K-0542.

ABSTRACT: (U) Much of optimal stochastic control theory is concerned with diffusion models. Such models are often only idealizations (or limits in an appropriate sense) of the actual physical process, which might be driven by a wide bandwidth (not white) process or be a discrete parameter system with correlated driving noises. Optimal or nearly optimal controls, derived for the diffusion models, would not normally be useful or even of much interest, if they were not also 'nearly optimal' for the physical system which the diffusion approximates. It turns out that, under quite broad conditions, the 'nearly optimal' controls for the diffusions do have this desired robustness property and are 'nearly optimal' for the physical (say wide band noise driven) process, even when compared to controls which can depend on all the (past) driving noise. The authors treat the problem over a finite time interval, as well as the average cost per unit time problem. Extensions to discrete parameter systems, and to systems stopped on first exit from a bounded domain are also discussed. Weak convergence

AD-A162 271

AD-A162 271

UNCLASSIFIED

PAGE 113

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 270

7/4

AD-A162 270

CONTINUED

PITTSBURGH UNIV PA SURFACE SCIENCE CENTER

IDENTIFIERS: (U) PEB1102F, WUAFOSR2303A2

(U) Surface Bonding of the NH<sub>3</sub> and NH<sub>2</sub> Species to Ni(110),

JUL 85

3P

PERSONAL AUTHORS: Aivey, M. D. ; Klaubner, C. ; Yates, J. T. , Jr.;

CONTRACT NO. AFOSR-82-0133

PROJECT NO. 2303

TASK NO. A2

MONITOR: AFOSR  
TR-85-0999

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Vacuum Science and Technology, VAS n3 p1631-1632 May/Jun 85.

ABSTRACT: (U) Using electron impact, we have converted NH<sub>3</sub>(ads) to NH<sub>2</sub>(ads) to NH<sub>2</sub>(ads) on the Ni(110) surface. Below 300 K, NH<sub>3</sub> is bound nondissociatively to Ni ridge atoms on Ni(110) by electron donation from lone pair N electrons. Upon electron bombardment, the process NH<sub>3</sub>(ads) plus 55 eV yields NH<sub>2</sub>(ads) + H(ads) occurs quantitatively with a cross section of 1.6A. ESDIAD results indicative that the initial NH<sub>3</sub> species is oriented normally to the (110) surface with no azimuth ordering down to 29 K. In contrast, NH<sub>2</sub> is azimuthally ordered at 300 K with the plane of the species perpendicular to the rows of Ni atoms on the surface; this bending orientation is consistent with the molecular orbital structure of NH<sub>2</sub>. This species is stable to 375 K where it decomposes to N(ads) and H<sub>2</sub>(g). Keywords: Ammonia; Electron Stimulated Desorption; Ion angular distribution; Chemisorption; Reprints.

DESCRIPTORS: (U) \*AMMONIA, \*CHEMISORPTION, \*SURFACE CHEMISTRY, \*DESORPTION, BENDING, ORIENTATION(DIRECTION), ELECTRON IRRADIATION, ELECTRON IMPACT SPECTRA, DISTRIBUTION, IONS, ATOMS, ELECTRONS, SURFACES, STIMULATION(GENERAL), MOLECULAR ORBITALS, MOLECULAR STRUCTURE, REPRINTS, BONDING

AD-A162 270

AD-A162 270

UNCLASSIFIED

PAGE 114

EVK551

## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 265 12/1

AD-A162 264 12/1

PITTSBURGH UNIV PA CENTER FOR MULTIVARIATE ANALYSIS

CALIFORNIA UNIV SANTA BARBARA ALGEBRA INST

(U) Optimality Robustness of Tests in Two Population Problems.

(U) Convenient Stability Criteria for Difference Approximations of Hyperbolic Initial-Boundary Value Problems.

DESCRIPTIVE NOTE: Technical rept.,

AUG 85 17P

APR 85 19P

PERSONAL AUTHORS: Kariya, Takeaki ; Sinha, Bimal K. ;

PERSONAL AUTHORS: Goldberg, Moshe ; Tadmor, Eitan ;

REPORT NO. TR-85-32

CONTRACT NO. AFOSR-83-0150, AFOSR-79-0127

PROJECT NO. 2304

PROJECT NO. 2304

TASK NO. A5

TASK NO. A3

MONITOR: AFOSR

MONITOR: AFOSR

TR-85-0979

TR-85-1043

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The problems of testing the equality of two location parameters (without the presence of scale parameters) and the equality of two scale parameters (with or without the presence of location parameters) based on two independent samples are considered. It is shown that, under some mild conditions on the underlying distributions, the standard optimum invariant tests derived under normality or exponentiality continue to be optimum for a wide class of distributions. However, the tests are not null robust. As a technical tool, Wilksman's representation theorem is used. Keywords: Exponential distributions; Monotone likelihood ratio (MLR); Normal distribution; Null robustness; Optimality robustness; Multivariate analysis. (Author)

DESCRIPTORS: (U) \*NORMAL DISTRIBUTION, \*MULTIVARIATE ANALYSIS, \*POPULATION(MATHEMATICS), EXPONENTIAL FUNCTIONS, STATISTICAL DISTRIBUTIONS, TEST METHODS, NORMALITY, THEOREMS, INVARIANCE, OPTIMIZATION, STANDARDIZATION, SAMPLING

IDENTIFIERS: (U) Robust procedures, MLR(Monotone Likelihood Ratio), PE81102F, WUAFOSR2304A5

AD-A162 265

AD-A162 264

UNCLASSIFIED

PAGE 115 EVK551

SUPPLEMENTARY NOTE: Pub. in Mathematics of Computation, v44 n170 p361-377 Apr 85.

ABSTRACT: (U) New convenient stability criteria are provided in this paper for a large class of finite-difference approximations to initial-boundary value problems associated with the hyperbolic system  $u_{tt} = A(u_{xx}) + Bu + f$  in the quarter plane  $x > 0, t > 0$ . Using the new criteria, stability is easily established for numerous combinations of well-known basic schemes and boundary conditions, thus generalizing many special cases studied in the recent literature. Keywords: Stability; Finite difference approximations; Hyperbolic initial-boundary value problems; Reprints.

DESCRIPTORS: (U) \*STABILITY, \*BOUNDARY VALUE PROBLEMS, BOUNDARIES, APPROXIMATION(MATHEMATICS), FINITE DIFFERENCE THEORY, HYPERBOLAS

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A3

## UNCLASSIFIED

AD-A182 257 13/5 13/13 22/2 DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A182 249 12/1 1/3 LOCKHEED MISSILES AND SPACE CO INC PALO ALTO CA  
RESEARCH AND DEVELOPMENT DIV

(U) McDonnell Douglas Astronautics Co-HB Huntington Beach CA  
Passively Damped Joints for Advanced Space Structures.

DESCRIPTIVE NOTE: Annual technical rept. 15 May 83-13 Jun 84.

JUN 84 181P

PERSONAL AUTHORS: Trudell, Richard W.; Blevins, Creed E.;

REPORT NO. MDC-H1178

CONTRACT NO. F49820-83-C-0117

PROJECT NO. 2302

TASK NO. B1

MONITOR: AFOSR  
TR-85-1078

## UNCLASSIFIED REPORT

ABSTRACT: (U) This report contains a description of significant accomplishments including: (1) the development of a viscoelastic materials selection guide for this research activity; (2) the development of an analytic statics model of the joint specimens; (3) the design, fabrication and preliminary testing of 15 viscoelastic joint specimens; (4) the procurement, fabrication and assembly of most of the test equipment for the test program as well as the development of data reduction computer programs; and (5) the development and successful demonstration of a transient pulse method for evaluating energy losses in joints.

DESCRIPTORS: (U) \*JOINTS, \*DAMPING, PASSIVE SYSTEMS, STRUCTURAL ENGINEERING, VISCOELASTICITY, HYSTERESIS, TRUSSES, STIFFNESS, VIBRATION, DISSIPATION, CONTROL SYSTEMS, TRANSIENTS, COMPUTER PROGRAMS, SPACE SYSTEMS

IDENTIFIERS: (U) Space structures, Damper materials, Viscoelastic materials, Large space structures, PE81102F, WUAFOSR2302B1

AD-A182 257

## UNCLASSIFIED

PAGE 118 EVK551

DESCRIPTIVE NOTE: Final technical rept. May 82-Jul 84.

MAR 85 22P

PERSONAL AUTHORS: Thomas, P. D.; Whitney, A. K.;

REPORT NO. LMSC/F035808

CONTRACT NO. F49820-82-C-0085

PROJECT NO. 2307

TASK NO. A1

MONITOR: AFOSR  
TR-85-1058

## UNCLASSIFIED REPORT

ABSTRACT: (U) This report describes the progress in research on the properties of the Lockheed 3-D elliptic grid generation procedure and improvement of its capabilities for treating complex geometric features characteristic of aircraft configurations. Two areas of weakness in the original technique relate to the fundamentally important capability for generating curved-surface grids as a necessary prerequisite for generating 3-D space grids. These weaknesses were (1) difficulties associated with the limitations of Cartesian coordinates for describing convex surfaces; and problems in controlling the orthogonality of the grid near boundaries. The bulk of the first year's research resulted in development of a generalized system of elliptic grid generation equations that allow both the surface and the grid to be described in terms of an arbitrary system of curvilinear coordinates. Research in the second year was concerned primarily with the problem of grid orthogonality near boundaries. Three approaches investigated to improve the control that the user has over the angle at which grid lines intersect the boundaries were: (1) refinement of the original

AD-A182 249



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A182 249 CONTINUED

AD-A182 247 12/1

techniques; (2) development of techniques for marching from a given boundary using the angle as an initial condition; and (3) derivation of a fourth-order system that permits additional boundary conditions on the grid intersection angle. Keywords: Computational grid generation; Elliptic grid generation.

DESCRIPTORS: (U) \*GRIDS(COORDINATES). \*ELLIPSES, \*CURVES(GEOMETRY), \*LINEAR SYSTEMS, THREE DIMENSIONAL, AIRCRAFT, CONFIGURATIONS, COMPUTATIONS, GRIDS, CONVEX BODIES, SURFACES, EQUATIONS, CARTESIAN COORDINATES, BOUNDARIES, SURFACES, LIMITATIONS, ORTHOGONALITY, ELLIPSES, ANGLES, COORDINATES

IDENTIFIERS: (U) PE81102F, WUAFOSR2307A1

YALE UNIV NEW HAVEN CT DEPT OF ELECTRICAL ENGINEERING

(U) A Smooth Algorithm for Adaptive Stabilization of a Discrete Linear System with an Unknown High Frequency Gain.

85 5P

PERSONAL AUTHORS: Mudgett, D. R. ; Morse, A. S. ;

CONTRACT NO. AFOSR-84-0242, NSF-ECS84-13322

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-85-0962

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Automatic Control Conference, p77-80 1985.

ABSTRACT: (U) This paper presents a simple algorithm for adaptively stabilizing a linear one-dimensional discrete time process. Prior knowledge of the sign of the process high frequency gain is not required, and the adaptive control law is a continuous function of its arguments. Performance of the algorithm is considered and a simple modification is suggested to improve algorithm convergence rate while preserving system stability. (Reprints) (Author)

DESCRIPTORS: (U) \*ADAPTIVE CONTROL SYSTEMS, \*HIGH GAIN, ADAPTIVE SYSTEMS, ALGORITHMS, CONVERGENCE, FUNCTIONS, HIGH FREQUENCY, LINEAR SYSTEMS, MODIFICATION, RATES, REPRINTS, STABILITY, STABILIZATION, TIME DOMAIN, DISCRETE DISTRIBUTION, CONVERGENCE

IDENTIFIERS: (U) Smoothing, PE81102F, WUAFOSR2304A1

AD-A182 249

AD-A182 247

UNCLASSIFIED

PAGE 117 EVK551

## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 246

7/3

AD-A162 245

7/4

WISCONSIN UNIV-MADISON DEPT OF CHEMISTRY

WISCONSIN UNIV-MADISON DEPT OF PHYSICS

(U) Natural Abundance (<sup>13</sup>C and (<sup>29</sup>Si ENDOR Studies of Cyclopolyisilane Radical Anions,

(U) Infrared Emission and Atomic Transitions.

DESCRIPTIVE NOTE: Annual technical rept. 1 Aug 84-31 Jul 85,

85 5P

PERSONAL AUTHORS: Kirste, B. ; West, R. ; Kurreck, H. ;

AUG 85 3P

CONTRACT NO. F49620-83-C-0044

PERSONAL AUTHORS: Lin, Chun C. ;

PROJECT NO. 2303

CONTRACT NO. AFOSR-83-0312

TASK NO. 82

PROJECT NO. 2301

MONITOR: AFOSR

TASK NO. A4

TR-85-1002

MONITOR: AFOSR

TR-85-1101

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of American Chemistry Society, v107 p3013-3016 1985.

ABSTRACT: (U) <sup>13</sup>C and <sup>29</sup>Si Electron Nuclear Double Resonance (ENDOR) signals of the peralkylcyclosilane radical anions, (t-BuMeSi)<sub>4</sub>(J) and (Et<sub>2</sub>Si)<sub>5</sub>(-) have been observed in natural abundance; this is the first <sup>29</sup>Si ENDOR study of Silicon-centered radicals. The relaxation behavior of the <sup>29</sup>Si and <sup>13</sup>C nuclei have been investigated. The ENDOR results show only a small hyperfine anisotropy for <sup>29</sup>Si, consistent with Si-Si or 3d spin population but not with p1-type delocalization. The relaxation behavior of <sup>13</sup>C nuclei and the temperature dependence of hyperfine couplings are interpreted in terms of internal molecular dynamics. (Author)

DESCRIPTORS: (U) \*POLYSILANES, \*CYCLIC COMPOUNDS, ANIONS, CHEMICAL RADICALS, DYNAMICS, MOLECULAR PROPERTIES, RELAXATION, TEMPERATURE, INTERNAL

IDENTIFIERS: (U) PE61102F, WUAFOSR2303B2

ABSTRACT: (U) The general objective of this research project is to study radiative transitions in atoms and molecules especially those relevant to infrared radiation. Major efforts include (i) determination of optical emission cross sections for atomic oxygen transitions produced by electron-impact dissociation of O<sub>2</sub>, (ii) electron excitation from a metastable level to a higher level, (iii) excitation behaviors of Na atoms, (iv) production of excited N atoms by electron impact on N<sub>2</sub>. Keywords: Infrared radiation; Radiative transitions; Electron-impact excitation; Excitation cross sections; Dissociation; Metastable atoms; Oxygen; Nitrogen; Sodium.

DESCRIPTORS: (U) \*ELECTRON TRANSITIONS, \*EMISSION SPECTRA, \*INFRARED SPECTRA, ATOMS, DISSOCIATION, ELECTRONS, EXCITATION, IMPACT, INFRARED RADIATION, METASTABLE STATE, MOLECULES, NITROGEN, OPTICAL CROSS SECTIONS, OXYGEN, SODIUM, ELECTRON IMPACT SPECTRA

IDENTIFIERS: (U) WUAFOSR2301A4, PE61102F

AD-A162 246

AD-A162 245

UNCLASSIFIED

PAGE 118

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 236 12/1

CALIFORNIA UNIV SANTA BARBARA ALGEBRA INST

(U) Some Inequalities for lp Norms of Matrices,

OCT 84 6P

PERSONAL AUTHORS: Goldberg, Moshe ;

CONTRACT NO. AFOSR-83-0150

PROJECT NO. 2304

TASK NO. A3

MONITOR: AFOSR  
TR-85-1047

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in International Series of  
Numerical Mathematics, v71 p185-189 1984.

ABSTRACT: (U) The purpose of this reprint is to prove  
several inequalities which describe certain  
submultiplicativity properties of norms for matrices.  
(Author)

DESCRIPTORS: (U) \*INEQUALITIES, MATRICES(MATHEMATICS),  
REPRINTS

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A3

AD-A162 236

UNCLASSIFIED

AD-A162 234 9/2

DUKE UNIV DURHAM NC DEPT OF COMPUTER SCIENCE

(U) Associative Networks on a Massively Parallel Computer.

DESCRIPTIVE NOTE: Master's thesis,

OCT 85 84P

PERSONAL AUTHORS: Jackoway, Gary ;

CONTRACT NO. AFOSR-83-0205

PROJECT NO. 2304

TASK NO. A7

MONITOR: AFOSR  
TR-85-1050

UNCLASSIFIED REPORT

Availability: Document partially illegible.

ABSTRACT: (U) A generalization of semantic networks,  
called an associative network is mapped onto a massively  
parallel processor which is currently under development.  
The results show: - The time required to process a query  
is dependent strictly on the pattern of the query, not on  
the size of the classes being processed. - The order of  
processing a query does not affect the speed. - Although  
we do not receive anywhere near an n-fold speedup by  
using n processors, we still receive significant  
performance benefits over a single processor. - The  
associative network may be used not just as a semantic  
network, for example, it also allows some problems  
involving numerical minimizations to be solved  
efficiently. The primary result of this work is that a  
large number of simple processors, each responsible for a  
small piece of information, can work in unison to answer  
queries significantly faster than a single, highly  
complex processor can.

DESCRIPTORS: (U) \*ASSOCIATIVE PROCESSING, \*PARALLEL  
PROCESSORS, NETWORKS, PROCESSING EQUIPMENT, INTERROGATION,  
PATTERNS, PROCESSING

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A7

AD-A162 234

PAGE 119 EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 227 11/6 22/2

AD-A162 227 CONTINUED

ARIZONA STATE UNIV TEMPE COLL OF ENGINEERING AND APPLIED SCIENCES

(U) Investigation of Material Problems for High Temperature, High Power Space Energy-Conversion Systems.

DESCRIPTIVE NOTE: Annual progress rept. no. 2, 1 May 84-30 Apr 85,

85 272P

PERSONAL AUTHORS: Jacobson, Dean L.; Morris, James F.; Ramalingam, Mysore; Snir, Shlomo; Bice, Charles;

CONTRACT NO. AFOSR-83-0067

PROJECT NO. 2306

TASK NO. A2

MONITOR: AFOSR  
TR-85-1028

UNCLASSIFIED REPORT

ABSTRACT: (U) Specific areas of research include investigations of methods of decreasing creep at the high temperatures encountered in the space environment; investigations for improving the properties of refractory metals, tungsten in particular, by alloy additions of rhenium, thorium and hafnium carbide; and development of emissivity data for materials of interest at elevated temperatures. The baseline system of tungsten, rhenium alloys is being researched to improve recrystallization characteristics, creep resistance etc. Impurity distributions and their deleterious phenomena are studied. Micro-alloying with thorium and hafnium is being evaluated because of their obvious influences on recrystallization; impurity segregation and embrittlement; solution, precipitation and embrittlement; solution, precipitation and dispersion strengthening; as well as other effects of their intensive gettering capabilities. The alloys are sintered and swaged into rods and wires for various high-temperature mechanical and electronic testing. Testing devices include: a high-temperature thermionic-emission microscope; a specially designed high-temperature vacuum tensile-testing machine; a specially

AD-A162 227

AD-A162 227

UNCLASSIFIED

PAGE 120

EVK551

designed and built zone refiner for possible refining conventional metallographic procedures; SEM, TEM and Auger surface analyses.

DESCRIPTORS: (U) \*TUNGSTEN ALLOYS, \*SPACECRAFT COMPONENTS, \*RHENIUM ALLOYS, ALLOYS, CARBIDES, CREEP, CREEP STRENGTH, DISPERSION HARDENING, ELECTRONICS, EMBRITTLEMENT, EMISSIVITY, HAFNIUM, HAFNIUM COMPOUNDS, HIGH TEMPERATURE, IMPURITIES, MECHANICAL PROPERTIES, METALLOGRAPHY, RECRYSTALLIZATION, REFINING, REFRACTORY METALS, RHENIUM, RODS, SEGREGATION(METALLURGY), SPACE ENVIRONMENTS, STRENGTH(MECHANICS), SURFACE ANALYSIS, TEST METHODS, THORIUM, THORIUM DIOXIDE, TUNGSTEN, GETTERING, AUGER ELECTRON SPECTROSCOPY, THERMIONIC EMISSION, SECONDARY EMISSION, ELECTRON SPECTROSCOPY, ZONE MELTING, SWAGING, SINTERING

IDENTIFIERS: (U) Zone refiners, PE81102F, WUAFOSR2306A2

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 222 9/2

AD-A162 221 12/1

DUKE UNIV DURHAM NC DEPT OF COMPUTER SCIENCE

MASSACHUSETTS INST OF TECH CAMBRIDGE

(U) The Correction of Ill-Formed Input Using History-Based Expectation with Applications to Speech Understanding.

(U) Numerical Algorithms & Parallel Tasking.

DESCRIPTIVE NOTE: Technical paper,

DESCRIPTIVE NOTE: Annual rept. 12 Oct 84-15 Sep 85.

OCT 85 48P

SEP 85 50P

PERSONAL AUTHORS: Fink, Pamela K.; Biermann, Alan W.;

PERSONAL AUTHORS: Kelma, Virginia;

CONTRACT NO. AFOSR-83-0205, NSF-MCS79-04120

CONTRACT NO. AFOSR-82-0210

PROJECT NO. 2304

PROJECT NO. 2304

TASK NO. A7

TASK NO. A3

MONITOR: AFOSR

MONITOR: AFOSR  
TR-85-1052

TR-85-1052

TR-85-0988

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Sponsored in part by Grant NSF-MCS81-113491.

ABSTRACT: (U) A method for error correction of ill-formed input is described which acquires dialogue patterns in typical usage and uses these patterns to predict new inputs. Error correction is done by strongly biasing parsing toward expected meanings unless clear evidence from the input shows the current sentence is not expected. A dialogue acquisition and tracking algorithm is presented along with a description of its implementation in a power of the error correction methodology when stereotypic dialogue occurs. (Author)

DESCRIPTORS: (U) \*ERROR CORRECTION CODES, \*INPUT, ACQUISITION, ALGORITHMS, METHODOLOGY, PARSERS, PATTERNS, SPEECH, TRACKING, WORDS(LANGUAGE), BIAS

IDENTIFIERS: (U) Speech understanding systems, PE81102F, WUAFOSR2304A7

ABSTRACT: (U) The long term goals of this research activity are derived from concurrent computing with emphasis on numerical algorithms that support a variety of scientific applications. Among the applications of immediate interest are signal processing, high statistical methods such as the bootstrap. The shorter term focus has been the refinement and enhancement of the concurrent computing environment itself and the numerical algorithms that form the foundation for the applications. The computer systems that support this research use hardware manufactured by Intel -- with the 8088 cpu and the 8087 floating point processor at the heart of each node. The nodes are contained in workstations (with up to seven Workers and a Manager in a workstation) that can operate independently or can be linked together during execution. Worker structure and memory are configurable to support experiments conducted in the course of this research. Keywords: Parallel processing; Synchronization(electronics).

DESCRIPTORS: (U) \*ALGORITHMS, \*DATA PROCESSING, COMPUTATIONS, COMPUTERS, DUAL MODE, ENVIRONMENTS, PARALLEL PROCESSING, SIGNAL PROCESSING, STATISTICAL PROCESSES, CONFIGURATIONS, SYNCHRONIZATION(ELECTRONICS), COMPUTER OPERATORS, FLOATING POINT OPERATION

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A3

AD-A162 222

AD-A162 221

UNCLASSIFIED

PAGE 121 EVK551

## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 220 11/4 11/5 11/7

AD-A162 218 7/4 7/3

RENSSELAER POLYTECHNIC INST TROY NY DEPT OF CIVIL  
ENGINEERING

OKLAHOMA STATE UNIV STILLWATER DEPT OF CHEMISTRY

(U) Analysis of Progressive Matrix Cracking in Composite  
Laminates.(U) Monte Carlo Transition-State Study of Angular Momentum  
Effects on the Unimolecular Dissociation of CH(4) on  
the Duchovic-Hase-Schlegel ab initio Surface.

DESCRIPTIVE NOTE: Final rept. 1 Sep 82-31 Aug 84.

APR 85 7P

MAR 85 70P

PERSONAL AUTHORS: Dvorak, George J. ;  
Donald L. ;

PERSONAL AUTHORS: Viswanathan, R. ; Raff, L. M. ; Thompson,

CONTRACT NO. AFOSR-82-0308

CONTRACT NO. AFOSR-82-0311

PROJECT NO. 2302

PROJECT NO. 2303

TASK NO. B2

TASK NO. B3

MONITOR: AFOSR

MONITOR: AFOSR  
TR-85-1030

TR-85-1084

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) This report summarizes recent results of studies on progressive ply cracking in fibrous laminates. Evaluation of stiffness changes caused by systems of aligned slit cracks which are parallel to the fiber direction in a unidirectional composite lamina is discussed. Results obtained by the self-consistent method are presented. Next, a procedure for estimating instantaneous crack densities and stiffness changes in a lamina subjected to a prescribed strain history is outlined. These results are extended to analysis of laminated composite plates under in-plane stresses. Specific examples and comparisons of analytical and experimental results are presented for two graphite-epoxy systems. Keywords: Composite materials; Cracking; Damage accumulation.

DESCRIPTORS: (U) \*COMPOSITE MATERIALS, \*LAMINATES, \*CRACKS, \*DAMAGE, \*FIBERS, DENSITY, HISTORY, STRAIN(MECHANICS), EPOXY RESINS, GRAPHITED MATERIALS, ACCUMULATION, PLATES, CONSISTENCY, STIFFNESS, UNIDIRECTIONAL

IDENTIFIERS: (U) Matrix cracking, PE81102F,  
WJAFOSR230282

AD-A162 220

AD-A162 218

UNCLASSIFIED

PAGE 122 EVK551

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v82  
n7 p3083-3087, 1 Apr 85.

ABSTRACT: (U) A previously formulated Monte Carlo transition-state theory approach to unimolecular reactions has been extended to calculation of microcanonical rate coefficients for specific angular momentum states. The method is applied to a study of two-center dissociation of CH<sub>4</sub> on the Duchovic-Hase-Schlegel (DHS) ab initio potential-energy surface. The rotationally averaged microcanonical rate coefficients on the DHS surface are found to be consistently less than those previously calculated on a semiempirical surface due principally to the larger C-H bond dissociation energy on the DHS surface. The rate coefficients are found to be relatively insensitive to the other topographical features of the potential-energy surface. Angular momentum is found to reduce  $k(E;J)$  by an amount in excess of the centrifugal effect. The magnitude of the angular momentum effect is found to decrease as the ratio of the rotational energy to the energy in excess of threshold decreases. Overall, the MCTST procedure is found to be computationally efficient for such calculations. Keywords: Monte Carlo; Momentum; Microcanonical rate; Methane; and Reprints.

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 218 CONTINUED

AD-A162 212 5/1 9/2

DESCRIPTORS: (U) \*ANGULAR MOMENTUM, \*MONTE CARLO METHOD,  
\*METHANE, \*CHEMICAL DISSOCIATION, CENTRIFUGAL FIELDS,  
COEFFICIENTS, ENERGY, METHANE, MOMENTUM, RATES, RATIOS,  
REACTION KINETICS, REPRINTS, ROTATION, POTENTIAL ENERGY

IOWA UNIV IOWA CITY APPLIED-OPTIMAL DESIGN LAB  
(U) Database Management in Design Optimization.

DESCRIPTIVE NOTE: Annual rept. Oct 82-Sep 83,

IDENTIFIERS: (U) PE81102F. WUAFOSR2303B3

OCT 83 237P

PERSONAL AUTHORS: Sreekantamurthy, T. ; Rajan, S. D. ; Reddy,  
C. P. D. ; Staley, D. T. ; Bhatti, M. A. ;

REPORT NO. CAD-SS-83-17

CONTRACT NO. AFOSR-82-0322

PROJECT NO. 2307

TASK NO. B1

MONITOR: AFOSR  
TR-85-1083

UNCLASSIFIED REPORT

ABSTRACT: (U) The report describes fundamental concepts, needs and requirements of a database management system for design optimization. Type of data needing management are identified. A preliminary database management system for structural optimization has been designed, implemented, and evaluated. Detailed specifications for a desirable database management system for more general design optimization environment have been developed. Some important specifications for the system are (1) data independence, (2) multiple logical views of the data, (3) memory management, (4) matrix operations utilities, (5) query language for use in interactive sessions as well as applications programs, and (6) management of permanent, temporary, global and local databases. Such capabilities must be available for design optimization applications. A comprehensive review of literature on database management systems for engineering computations has been completed. It is noted that the field is fairly new. Some systems have been developed in the recent past. Their favorable features and limitations are identified. Based on these studies, development of a comprehensive engineering database management system has been in progress. The system is being developed and integrated into design optimization methods. It will become a core for design.

AD-A162 218

AD-A162 212

UNCLASSIFIED

PAGE 123 EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 212 CONTINUED

AD-A162 207 9/2

Implementation and evaluation of databases for engineering optimization applications.

DUKE UNIV DURHAM NC DEPT OF COMPUTER SCIENCE

DESCRIPTORS: (U) \*DATA BASES, \*DATA MANAGEMENT, \*MANAGEMENT INFORMATION SYSTEMS, \*MANAGEMENT PLANNING AND CONTROL, COMPUTATIONS, ENGINEERING, OPTIMIZATION, MANAGEMENT, MEMORY DEVICES, OPTIMIZATION, ENGINEERING, DATA BASES, GLOBAL, METHODOLOGY, INTERROGATION, LANGUAGE, STRUCTURES

(U) Automatic Programming: A Tutorial on Formal Methodologies,

85 24P

PERSONAL AUTHORS: Biermann, Alan W. ;

CONTRACT NO. AFOSR-81-0221

IDENTIFIERS: (U) WUAFOSR2307B1, PE81102F

PROJECT NO. 2304

TASK NO. A7

MONITOR: AFOSR  
TR-85-1051

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Symbolic Computation, v1 p119-142 1985.

ABSTRACT: (U) Ten methodologies for automatic program construction are presented, discussed and compared. Some of the techniques generate code from formal input-output specifications while others work from examples of the target behaviour or from natural language input. Keywords: Learning from examples; Input-output specifications.

DESCRIPTORS: (U) \*AUTOMATIC PROGRAMMING, CONSTRUCTION, INPUT, LEARNING, NATURAL LANGUAGE, METHODOLOGY, COMPARISON, INPUT OUTPUT PROCESSING, SPECIFICATIONS

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A7

AD-A162 212

AD-A162 207

UNCLASSIFIED

PAGE 124

EVK551



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SYSTEMS COMMAND TECHNIC. (U) AIR FORCE OFFICE OF  
SCIENTIFIC RESEARCH BOLLING AFB DC B J WERT MAR 86

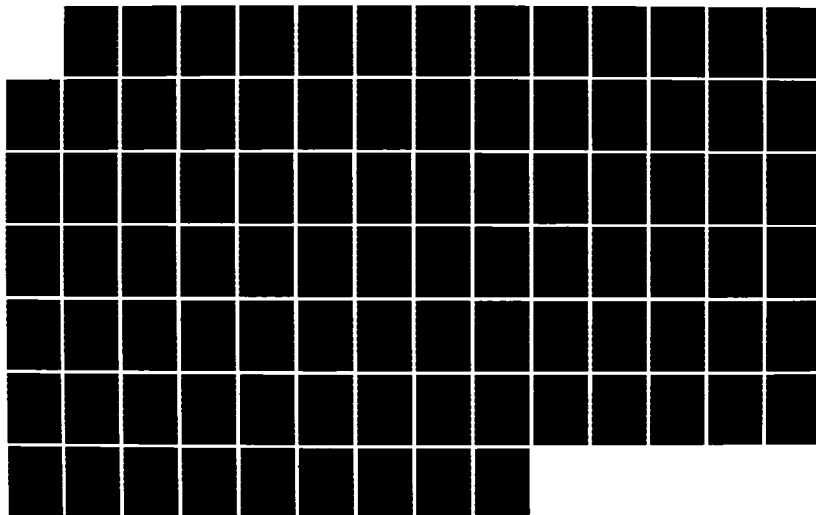
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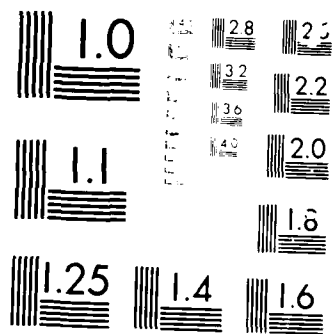
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DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A182 208 12/1 20/11

AD-A182 208 CONTINUED

RENSELAER POLYTECHNIC INST TROY NY DEPT OF MATHEMATICAL SCIENCES

(U) Adaptive Finite Element Methods and the Numerical Solution of Shear Band Problems.

84

24P

MODELS, \*SHEAR PROPERTIES, ADAPTIVE SYSTEMS, DISPLACEMENT, HEAT, RELEASE, IRREVERSIBLE PROCESSES, MECHANICAL PROPERTIES, SHEAR PROPERTIES, NUMERICAL ANALYSIS, SOLUTIONS(GENERAL), ADAPTATION, FINITE ELEMENT ANALYSIS, CUTTING, BANDS(STRIPS), SHEAR PROPERTIES, HIGH RATE, GRADIENTS, METALWORKING, PROBLEM SOLVING, LOADS(FORCES), REPRINTS

PERSONAL AUTHORS: Drew, D. A. ; Flaherty, J. E. ;

IDENTIFIERS: (U) \*Shear bands, PEG1102F, WUAFOSR2304A3

CONTRACT NO. DAAG28-82-K-0197, AFOSR-80-0192

PROJECT NO. 2304

TASK NO. A3

MONITOR: AFOSR,ARO  
TR-85-1045, 19512.2-MA

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Phase Transformations and Material Instabilities in Solids, p37-60 1984. Supported in part by contract DAAG28-82-K-0185.

ABSTRACT: (U) Shear bands are localized regions of very high shear strain which arise as a result of high rates of loading. They occur in metal forming and cutting processes and in impact and penetration problems. This reprint describes a mathematical model for the formation of shear bands in simple shear that involves the description of irreversible mechanical shear and the resulting heat release. The location of a shear band is unknown in advance, and the evolution results in large gradients of displacement, velocity, and temperature. Shear band formation, therefore, offers an interesting and physically important application of a code able to resolve small-scale transient structures. The authors use an adaptive finite element code to solve several problems involving shear band formation. The code automatically locates regions with large gradients and adaptively concentrates finite elements there in order to minimize approximately the discretization error per time step. Results show the development of shear bands under many circumstances and indicate some possible mechanisms for their formation.

DESCRIPTORS: (U) \*FINITE ELEMENT ANALYSIS, \*MATHEMATICAL

AD-A182 208

AD-A182 208

UNCLASSIFIED

PAGE 125

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 199 12/1

AD-A162 198 8/1

FLORIDA STATE UNIV TALLAHASSEE DEPT OF STATISTICS

TEXAS UNIV AT AUSTIN DEPT OF CHEMISTRY

(U) Inconsistency of the Maximum Likelihood Estimator of a Distribution Having Increasing Failure Rate Average.

(U) Alternative View of Enzyme Reactions.

85 8P

APR 85 7P

PERSONAL AUTLJRS: Boyles, R. A. ; Marshall, A. W. ; Proschan, F. ;

PERSONAL AUTHORS: Devar, Michael J. S. ; Storch, Donn M. ;

CONTRACT NO. F49820-82-K-0007

CONTRACT NO. F49820-83-C-0024

PROJECT NO. 2304

PROJECT NO. 2303

TASK NO. A5

TASK NO. B2

MONITOR: AFOSR  
TR-85-1021

MONITOR: AFOSR  
TR-85-1014

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Annals of Statistics, v13 n1 p413-417 1985.

SUPPLEMENTARY NOTE: Pub. in Proceedings of the National Academy of Sciences, v82 p2225-2229 Apr 85.

ABSTRACT: (U) Marshall and Proschan (1965) showed that the MLE for a life distribution with increasing failure rate is strongly consistent. Third reprint shows the MLE for a life distribution with increasing failure rate average is not consistent; in fact, maximum likelihood estimation in the IFRA case yields estimators of the average failure rate and of the distribution function which, in general, converge a.s. to values other than the true values. In the decreasing failure rate average case, the MLE fails to exist. (Author)

ABSTRACT: (U) Since adsorption of the substrate in the active site of an enzyme can occur only if all solvent is squeezed out from between them, any reaction between them takes place in the absence of any intervening solvent-i.e., as it would in the gas phase. Recent work has shown that ionic reactions in the gas phase often differ greatly from analogous processes in solution. Therefore, current interpretations of enzyme reactions in terms of solution chemistry are misguided. The large rates and specificity of enzyme reactions may be due simply to elimination of the solvent. The cleavage of peptides by chymotrypsin and carboxypeptidase A can be interpreted satisfactorily in this way. (Author)

DESCRIPTORS: (U) \*DISTRIBUTION FUNCTIONS, \*MAXIMUM LIKELIHOOD ESTIMATION, FAILURE, RATES, REPRINTS

DESCRIPTORS: (U) \*ENZYMES, \*PEPTIDES, \*CHYMOTRYPSIN, ADSORPTION, CLEAVAGE, ELIMINATION, ENZYMES, PEPTIDES, RATES, SITES, SOLUTIONS(MIXTURES), SOLVENTS, SUBSTRATES, VAPOR PHASES, REPRINTS

IDENTIFIERS: (U) \*Life distributions, PE81102F, WUAFOSR2304A5

IDENTIFIERS: (U) \*Carboxy Peptidase, PE81102F, WUAFOSR2303B2

AD-A162 199

AD-A162 198

UNCLASSIFIED

PAGE 128

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 196

17/2

AD-A162 194

20/11

12/1

22/2

MASSACHUSETTS UNIV AMHERST DEPT OF ELECTRICAL AND  
COMPUTER ENGINEERING

CLARKSON UNIV POTSDAM NY DEPT OF MECHANICAL AND  
INDUSTRIAL ENGINEERING

(U) A Study of Error Detection and Correction Codes.

(U) Nonlinear Analysis and Optimal Design of Dynamic  
Mechanical Systems for Spacecraft Application.

DESCRIPTIVE NOTE: Final scientific rept. 1 Feb 82-31 Jul  
85.

DESCRIPTIVE NOTE: Annual technical rept. 1 Feb 84-31 Jan  
85.

SEP 85

12P

FEB 85

32P

PERSONAL AUTHORS: Wolf, Jack K. ;

PERSONAL AUTHORS: Wilmer, K. D. ; Sathyamoorthy, M. ;

CONTRACT NO. AFOSR-82-0061

CONTRACT NO. AFOSR-84-0078

PROJECT NO. 2304

PROJECT NO. 2302

TASK NO. A6

TASK NO. B1

MONITOR: AFOSR  
TR-85-0990

MONITOR: AFOSR  
TR-85-1017

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) This research was concerned with a number  
of topics related to error control for noisy  
communications channels. Specific topics included:  
probability of undetected error for error detection codes,  
coding for discrete-time continuous-amplitude signalling,  
tail-biting for convolutional codes, combined modulation  
and coding using amplitude, phase and frequency  
modulation, and coding for fault tolerant systems and  
VLSI.

DESCRIPTORS: (U) \*ERROR DETECTION CODES, CHANNELS,  
CODING, COMMUNICATION AND RADIO SYSTEMS, CONTROL,  
CONVOLUTION, CORRECTIONS, DETECTION, ERRORS, FAULTS,  
FREQUENCY MODULATION, MODULATION, TOLERANCE

IDENTIFIERS: (U) PE81102F, WJAFOSR2304A8

ABSTRACT: (U) A nonlinear finite element procedure has  
been developed for the dynamic vibrational analysis of  
planar mechanisms. The analysis takes into account the  
effects of geometric and material nonlinearities. The  
vibrational effects and coupling of deformations. The  
effects of nonlinearities have been found to be  
significant on the dynamic behavior. Due to the complex  
nature of this nonlinear analysis procedure, an efficient  
optimal design approach using an optimality criterion  
technique was developed. The new optimization technique,  
called the Gauss Nonlinearly Constrained Technique, was  
developed in such a way that is applicable to design  
problems with nonlinear objective functions and  
constraints. The applicability of this method has been  
demonstrated with example problems consisting of  
objective functions of various complexities. Complete  
details of the nonlinear finite element procedure as well  
as the optimization technique are available in the  
appendix. Keywords: Vibrational analysis; Optimization;  
Geometric nonlinearity; Material nonlinearity.

DESCRIPTORS: (U) \*FINITE ELEMENT ANALYSIS, \*VIBRATION,  
\*NONLINEAR ANALYSIS, \*PLANAR STRUCTURES,  
COUPLING(INTERACTION), DEFORMATION, DYNAMICS, GEOMETRY,

AD-A162 196

AD-A162 194

UNCLASSIFIED

PAGE 127

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 194 CONTINUED

AD-A162 169 12/1

MATERIALS, MECHANICAL COMPONENTS, NONLINEAR SYSTEMS,  
OPTIMIZATION, SPACECRAFT, DYNAMIC RESPONSE, STRUCTURAL  
RESPONSE, FUNCTIONS(MATHEMATICS)

PITTSBURGH UNIV PA CENTER FOR MULTIVARIATE ANALYSIS

(U) An Inequality Concerning the Deviation between  
Theoretical and Empirical Distributions.

IDENTIFIERS: (U) PEB1102F, WUAFOSR2302B1

DESCRIPTIVE NOTE: Technical rept.,

AUG 85 17P

PERSONAL AUTHORS: Zhao, Lin-Cheng ;

REPORT NO. TR-85-30

CONTRACT NO. F49620-85-C-0008

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-85-0878

UNCLASSIFIED REPORT

ABSTRACT: (U) In this paper the author established an inequality concerning the uniform deviation between theoretical and empirical distributions. An application in strong convergence of nearest neighbor density estimate is also discussed. Keywords: Sets(Mathematics); and Random variables. (Author)

DESCRIPTORS: (U) \*INEQUALITIES, \*DISTRIBUTION FUNCTIONS,  
RANDOM VARIABLES, CONVERGENCE, DENSITY, ESTIMATES

IDENTIFIERS: (U) Sets(Mathematics)

AD-A162 194

AD-A162 169

UNCLASSIFIED

PAGE 128

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 168 20/4

AD-A162 168 CONTINUED

INDIANA UNIV-PURDUE UNIV AT INDIANAPOLIS SCHOOL OF  
ENGINEERING AND TECHNOLOGY

FLOW FIELDS, EULER ANGLES, NAVIER STOKES EQUATIONS, WING  
BODY CONFIGURATIONS, DATA REDUCTION, COMPUTER  
APPLICATIONS, PARALLEL PROCESSORS

(U) A Zonal Approach to the Design of Finite Element Grids  
for 3-D Transonic Flows with Complex Geometries.

IDENTIFIERS: (U) NACA 0012 Airfoils, Block design,  
WUAFOSR2307A4, FEB1102F

DESCRIPTIVE NOTE: Annual rept. 1 Jun 83-30 Jun 85.

JUN 85 98P

PERSONAL AUTHORS: Ecer, Akin ;

CONTRACT NO. F49620-83-K-0034

PROJECT NO. 2307

TASK NO. A4

MONITOR: AFOSR  
TR-85-1081

UNCLASSIFIED REPORT

ABSTRACT: (U) A block-structured solution scheme is developed for the analysis of three-dimensional transonic flows. The scheme is based on the solution of potential flow equations for individual blocks representing part of the flow field. Based on a previously developed block-structured grid generation scheme, appropriate computational grids are generated for each of the blocks depending on the complexity of the local flow field. The equations are then solved to provide a solution of a large problem in terms of an assembly of smaller problems for each block. Numerical results illustrate the applicability of the method for a three-dimensional flow field around a wing profile (NACA0012). Different block structures are analyzed to demonstrate the robustness and the accuracy of the developed method. Finally a three-dimensional wing-body configuration is analyzed and the results are compared with previously obtained single block solutions. The method is expandable to the solution of Euler and Navier-Stokes equations. It is also suited to be executed in a parallel processing environment. Keywords: Finite Element Method; Transonic Flow, Three Dimensional Flow; Potential Flow.

DESCRIPTORS: (U) \*TRANSONIC FLOW, \*THREE DIMENSIONAL FLOW, WINGS, POTENTIAL FLOW, FINITE ELEMENT ANALYSIS,

AD-A162 168

AD-A162 168

UNCLASSIFIED

PAGE 129

EVK551

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

## SEARCH CONTROL NO. EVK551

AD-A162 165

14/2

## COLUMBIA UNIV NEW YORK CENTER FOR STRATEGIC MATERIALS

(U) Equipment Acquired by Columbia University Center for Strategic Materials under DoD University Research Instrumentation Program.

DESCRIPTIVE NOTE: Final rept. 15 Jul 84-14 Jul 85.

SEP 85 21P

PERSONAL AUTHORS: Tien, John K. ;

CONTRACT NO. AFOSR-84-0225

PROJECT NO. 2917

TASK NO. A3

MONITOR: AFOSR  
TR-85-1039

## UNCLASSIFIED REPORT

ABSTRACT: (U) Columbia University purchased three pieces of equipment with grant money obtained from the Department of Defense under the University Research Instrumentation Program. This equipment includes (1) JSM-35cf Scanning Electron Microscope (2) PGT System4 Quantitative Energy Dispersive X-Ray Analysis Unit (3) Edwards E308A Coating/IBT 200 unit. For each item purchased there follows a brief summary describing the equipment, the manufacturer, and the cost. A status report on how well the equipment is operating in our labs will also be included. Finally, a summary of each program using the equipment donated by DOD is included with a description of how the equipment will help in attaining research objectives.

DESCRIPTORS: (U) \*LABORATORY EQUIPMENT, X RAY APPARATUS, ELECTRONIC SCANNERS, ELECTRON MICROSCOPES, OPTICAL COATINGS, RESOURCE MANAGEMENT, COST ANALYSIS, VACUUM DEPOSITION, INSTRUMENTATION, UNIVERSITIES

IDENTIFIERS: (U) WUAFOSR2917A3, PE61102F

AD-A162 165

## UNCLASSIFIED

AD-A162 160 11/1 20/4

## TEXAS A AND M UNIV COLLEGE STATION TURBOMACHINERY LABS

(U) Rotordynamic Forces Developed by Labyrinth Seals.

DESCRIPTIVE NOTE: Annual rept. 1 Sep 83-31 Aug 84.

NOV 84 187P

PERSONAL AUTHORS: Childs, Dara W. ; Rhode, David L. ;

CONTRACT NO. F49620-82-K-0033

PROJECT NO. 2302

TASK NO. B1

MONITOR: AFOSR  
TR-85-1070

## UNCLASSIFIED REPORT

ABSTRACT: (U) Numerous developments have been completed toward the accurate measurement and prediction of the fluid-structure-interaction forces on labyrinth seals. The test facility was refined and data acquisition was automated. Measurements were obtained of both stiffness and damping force coefficients for two labyrinth seal configurations operating with small rotor motion about its centered position. Only the cross-coupled damping coefficient exhibits significant sensitivity to shaft speed, and the coefficients increase monotonically with increasing supply-to-discharge pressure ratio. Fluid pre-rotation exhibits a strong influence on cross-coupled stiffness, which increases and decreases, respectively, with pre-rotation in and opposite to the direction of shaft rotation. Direct damping is less sensitive to fluid pre-rotation, and is generally largest for pre-rotation against the shaft direction. A simple Iwatsubo-based force coefficient model was also developed. Predictions obtain from the approximate model are much more sensitive to shaft speed than corresponding current measurements, and damping values are approximately one-fourth of those measured.

DESCRIPTORS: (U) \*ROTORS, \*SEALS(STOPPERS), COEFFICIENTS, CONFIGURATIONS, DAMPING, DATA ACQUISITION, MODELS, MOTION, POSITION(LOCATION), ROTATION, SENSITIVITY, SHAFTS(MACHINE ELEMENTS), STIFFNESS, TEST FACILITIES, DYNAMIC LOADS.

AD-A162 160

PAGE 130 EVK551



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 160 CONTINUED

AD-A162 158 11/4 20/11

RATES, FLUID DYNAMICS, DIRECTIONAL, COUPLING(INTERACTION),  
MATHEMATICAL PREDICTION

TEXAS A AND M UNIV COLLEGE STATION DEPT OF MECHANICAL  
ENGINEERING

IDENTIFIERS: (U) \*Labyrinth seals, Rotor shaft seals,  
PE81102F, WUAFOSR230281

(U) Nonlinear Dynamic Response of Composite Rotor Blades.

DESCRIPTIVE NOTE: Annual letter rept. 1 Sep 82-31 Aug 83,

OCT 83 51P

PERSONAL AUTHORS: Engblom, John J. ; Ochoa, Ozden D. ;

REPORT NO. ME-4788-83-10

CONTRACT NO. F49820-82-K-0032

PROJECT NO. 2307

TASK NO. 81

MONITOR: AFOSR  
TR-85-1058

UNCLASSIFIED REPORT

ABSTRACT: (U) Fundamental to the analysis of nonlinear dynamic response of composite rotor blades is the development of a continuum formulation that can accurately account for the effects of interlaminar shear and interlaminar normal stress variation thru-the-thickness of a laminate. Technical highlights of the research efforts to date are presented for each of the following proposed tasks: Nonlinear displacement formulation for composite media; Incorporate damage mechanisms into dynamic response formulations; and Correlation of formulated response model with experimental data. Keywords: Composite materials; Finite elements; Large displacement formulation; Assumed displacement; and Hybrid models.

DESCRIPTORS: (U) \*COMPOSITE MATERIALS, \*COMPOSITE STRUCTURES, \*LAMINATES, DISPLACEMENT, DYNAMIC RESPONSE, FINITE ELEMENT ANALYSIS, FORMULATIONS, HYBRID SYSTEMS, MODELS, NONLINEAR ANALYSIS, NONLINEAR SYSTEMS, RESPONSE, ROTOR BLADES, SHEAR PROPERTIES, FORMULAS(MATHEMATICS), DAMAGE, STRESSES

IDENTIFIERS: (U) Interlaminar shear, Interlaminar stresses, PE81102F, WUAFOSR230781

AD-A162 160

AD-A162 158

UNCLASSIFIED

PAGE 131

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 158

12/1

BROWN UNIV PROVIDENCE RI LEFSCHETZ CENTER FOR DYNAMICAL  
SYSTEMS

(U) Asymptotic Behavior of Constrained Stochastic  
Approximations via the Theory of Large Deviations.

DESCRIPTIVE NOTE: Interim technical rept..

JUL 85 55P

PERSONAL AUTHORS: Dupuis, Paul ; Kushner, Harold J. ;

REPORT NO. LCDS-85-12

CONTRACT NO. AFOSR-81-0118

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-85-1053

UNCLASSIFIED REPORT

ABSTRACT: (U) This document describes a projected  
recursive (or stochastic approximation) algorithm which  
arises frequently in applications in control and  
communications theory. There is a sizeable literature  
concerning its asymptotic properties as epsilon  
approaching limit of 0 with epsilon sub n approaching  
limit of t or epsilon n approaching infinity. Keywords:  
Convergence; Asymptotic normality.

DESCRIPTORS: (U) \*ALGORITHMS, \*APPROXIMATION(MATHEMATICS)  
RECURSIVE FUNCTIONS, CONTROL THEORY, ASYMPTOTIC  
NORMALITY, STOCHASTIC PROCESSES, ASYMPTOTIC SERIES,  
COMMUNICATION AND RADIO SYSTEMS

IDENTIFIERS: (U) PEB1102F, WUAFOSR2304A1

AD-A162 158

UNCLASSIFIED

AD-A162 153

12/1

MASSACHUSETTS UNIV AMHERST DEPT OF MATHEMATICS AND  
STATISTICS

(U) A Birth and Death Process Approximation for the  
Slotted ALOHA Algorithm.

DESCRIPTIVE NOTE: Technical rept..

AUG 85 16P

PERSONAL AUTHORS: Rising, W. ; Rosenkrantz, W. ;

CONTRACT NO. AFOSR-82-0187

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-85-1048

UNCLASSIFIED REPORT

Availability: Microfiche copies only.

ABSTRACT: (U) Many authors have concerned themselves  
with the bistable behavior of the finite-user slotted  
ALOHA protocol under heavy loading. Recently Nelson  
used a catastrophe-theoretic approach to demonstrate that  
under a fluctuating load the protocol suffers hysteresis  
as well as bistability. He uses results from catastrophe  
theory to give a possible improved control algorithm.  
Central to Nelson's approach is a diffusion approximation  
of the queue of backlogged users. This approximation has  
the advantage of yielding a continuing probability  
density for the process, thus allowing the use of  
(stochastic) catastrophe theory. Unfortunately, as will  
be seen later, the approximation requires difficult  
numerical integration and yields no closed form solution.  
It is being proposed here that the process should remain  
discrete, and that it can be approximated reasonably well  
as a birth-death process. This allows rapid computation  
of the approximate stationary distribution.

DESCRIPTORS: (U) \*APPROXIMATION(MATHEMATICS), ALGORITHMS,  
BEHAVIOR, BISTABLE DEVICES, COMPUTATIONS, CONTROL, DEATH,  
DIFFUSION, DISTRIBUTION, HEAVING, HYSTERESIS, NUMERICAL  
INTEGRATION, PROBABILITY DENSITY FUNCTIONS, STATIONARY,

AD-A162 153

PAGE 132 EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 153 CONTINUED

AD-A162 150 7/3 20/10

QUEUEING THEORY

TEXAS UNIV AT AUSTIN DEPT OF CHEMISTRY

IDENTIFIERS: (U) \*Birth and death processes, Slotted  
ALOHA algorithm, ALOHA system, PE81102F, WUAFOSR2304A5

(U) MNDO Study of Ring Opening in the Succinimidyl Radical,  
85 5P

PERSONAL AUTHORS: Dewar, Michael J. S.; Olivella, Santiago;

CONTRACT NO. F49620-83-C-0024

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-85-1013

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of the Chemical Society,  
Chemical Communications, p301-303 1985

ABSTRACT: (U) Calculated (MNDO) activation barriers for  
ring opening of the pi ground state and the low-lying  
sigma excited state of the succinimidyl radical suggest  
that at room temperature only the latter can react in  
this way; the calculated lifetime of the sigma radical  
agrees well with that estimated from kinetic studies.

DESCRIPTORS: (U) \*SUCCINIMIDES, \*CYCLIC COMPOUNDS,  
\*CHEMICAL RADICALS, ACTIVATION, BARRIERS, EXCITATION,  
GROUND STATE, KINETICS, LOW LEVEL, OPENING(PROCESS),  
RINGS, ROOM TEMPERATURE, REPRINTS, QUANTUM THEORY

IDENTIFIERS: (U) MNDO(Modified Neglect of Differential  
Overlap), PE81102F, WUAFOSR230382

AD-A162 153

AD-A162 150

UNCLASSIFIED

PAGE 133 EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A182 141 12/1

AD-A162 141 CONTINUED

DUKE UNIV DURHAM NC DEPT OF COMPUTER SCIENCE

DESCRIPTORS: (U) \*ALGORITHMS, \*DYNAMIC PROGRAMMING,  
PARALLEL PROCESSING, COMMUNICATION AND RADIO SYSTEMS,  
LABORATORY TESTS, COMPUTATIONS, BIOLOGY, TEST METHODS,  
SOLUTIONS(GENERAL), DIAGNOSIS(MEDICINE)

(U) Finding Test-and-Treatment Procedures Using Parallel  
Computation.

DESCRIPTIVE NOTE: Technical paper,

IDENTIFIERS: (U) PEB1102F, WUAFOSR2304A7

OCT 85 27P

PERSONAL AUTHORS: Duval, L. D. ; Wagner, R. A. ; Han, Y. ;  
Loveland, D. W. ;

REPORT NO. CS-1985-23

CONTRACT NO. AFOSR-83-0205

PROJECT NO. 2304

TASK NO. A7

MONITOR: AFOSR  
TR-85-1049

UNCLASSIFIED REPORT

Availability: Document partially illegible.

ABSTRACT: (U) A parallel algorithm for the NP-hard  
problem test-and-treatment is presented for a machine  
whose number of connections is  $3p(2 \text{ squared})$ , where  $p$  is  
the number of processing elements (PEs), and where the  
PEs are simple enough such that a machine with 2 to the  
20th power PEs is currently implementable and to the 30th  
power PE machine is feasible. The speedup of 0 (sub  $p$   
(log  $p$ ) is realizable because we are able to transform  
the dynamic programming solution into the ASCEND/DESCEND  
scheme with considerable attention to the communication  
problem. This algorithm is realized on the Boolean Vector  
Machine, a fully designed cube-connected-cycle system  
where processor allocation and other control issues have  
been faced. The particular NP-hard problem is of  
independent interest; it generalizes the binary testing  
problem by introducing treatments on an equal basis with  
tests. Applications of this test-and-treatment problem  
are found in medical diagnosis, systematic biology,  
machine fault location, laboratory analysis and many  
other fields. (Author)

AD-A182 141

AD-A162 141

UNCLASSIFIED

PAGE 134

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 140 11/4 12/1 22/2 11/6 AD-A162 140 CONTINUED

TEXAS A AND M UNIV COLLEGE STATION MECHANICS AND MATERIALS RESEARCH CENTER

(U) A Model for Predicting Thermomechanical Response of Large Space Structures.

DESCRIPTIVE NOTE: Annual technical rept. Mar 83-Apr 84,

JUN 84 184P

PERSONAL AUTHORS: Allen, D. H. ; Haisler, W. E. ;

REPORT NO. MM-4875-84-16

CONTRACT NO. F49620-83-C-0067

PROJECT NO. 2302

TASK NO. 81

MONITOR: AFOSR  
TR-85-1080

UNCLASSIFIED REPORT

ABSTRACT: (U) It is known that large space structures will be subjected to thermomechanical loadings and environmental conditions which are likely to degrade the constitutive properties of the structural materials, thus leading to possible failure of these vehicles. Therefore, it is desirable to develop new analytical models which are capable of accounting for these degraded properties so that design procedures can be improved. There are three important aspects of such an effort: selection and development of constitutive models applicable to large space structures, construction of analytical models and experimentation to determine the precise nature of the material parameters to be utilized in the analytical model. These three components of the research must be tied together into a single concise package in order to obtain a useful model. This research project is a three year effort to develop an analytical model capable of predicting the response of space structures with degrading material properties under quasi-static as well as dynamic cyclic thermomechanical loading conditions. Keywords: Larger space structures; Thermal loads; Constitutive properties; Finite element methods; and Environmental effects.

AD-A162 140

AD-A162 140

UNCLASSIFIED

PAGE 135

EVK551

DESCRIPTORS: (U) \*COMPOSITE MATERIALS, \*THERMOMECHANICS, \*COMPOSITE STRUCTURES, MATHEMATICAL PREDICTION, FINITE ELEMENT ANALYSIS, STRUCTURAL MEMBERS, LOAD DISTRIBUTION, COUPLING(INTERACTION), MATHEMATICAL MODELS, MECHANICAL PROPERTIES, THERMAL PROPERTIES, TRANSIENTS, CYCLES, VISCOPLASTIC PROPERTIES, POLYMERS, METAL MATRIX COMPOSITES, DYNAMIC RESPONSE, STRUCTURAL RESPONSE, DEGRADATION, EXPOSURE(GENERAL), SPACE ENVIRONMENTS, STRUCTURAL ANALYSIS, PARAMETRIC ANALYSIS

IDENTIFIERS: (U) Large space structures, \*Space structures, Cyclic loads, Thermal loads, Viscoelastic metals, Polymeric composites, Constitutive properties, PE81102F, WUAFOSR230281

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A182 139 22/2 20/11

AD-A182 139 CONTINUED

TEXAS A AND M UNIV COLLEGE STATION MECHANICS AND  
MATERIALS RESEARCH CENTER

THERMAL CONDUCTIVITY, PARAMETRIC ANALYSIS, RESPONSE,  
VARIATIONAL PRINCIPLES, EQUATIONS

(U) A Model for Predicting Thermomechanical Response of  
Large Space Structures.

IDENTIFIERS: (U) PE81102F, WUAF0SR2302B1

DESCRIPTIVE NOTE: Annual technical rept. May 84-Apr 85.

JUN 85 196P

PERSONAL AUTHORS: Allen, D. H.; Haisler, W. E. ;

REPORT NO. MM-4875-85-11

CONTRACT NO. F49620-83-C-0087

PROJECT NO. 2302

TASK NO. B1

MONITOR: AFOSR  
TR-85-1018

UNCLASSIFIED REPORT

ABSTRACT: (U) A model is being developed for predicting the thermomechanical response of large space structures to cyclic transient temperature loading conditions. The research is being conducted in the following stages: 1) selection and specialization of thermomechanical constitutive equations to be utilized in the analysis of large space structures; 2) construction (where necessary) of coupled energy balance equations (modified Fourier heat conduction equations) applicable to the constitutive models selected in item 1); 3) casting (where necessary) the resulting field laws into coupled and uncoupled variational principles suitable for use with the finite element method; 4) finite element discretization of the variational principles for several element types; 5) experimentation to determine material properties to be utilized in the constitutive models; and 6) parametric studies of the quasi-static and dynamic response of large space structures undergoing thermomechanically and environmentally degraded material properties.

DESCRIPTORS: (U) \*THERMOMECHANICS, \*SPACECRAFT, \*THERMAL CYCLING TESTS, COUPLING(INTERACTION), DYNAMIC RESPONSE, FINITE ELEMENT ANALYSIS, EQUATIONS, FOURIER ANALYSIS.

AD-A182 139

AD-A182 139

UNCLASSIFIED

PAGE 136

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 130 20/4

AD-A162 130 CONTINUED

SCIENTIFIC RESEARCH ASSOCIATES INC GLASTONBURY CT

LAYER, COHERENCE, STRUCTURAL PROPERTIES, WALLS, DYNAMICS,  
BOUNDARY LAYER, THICKNESS, NAVIER STOKES EQUATIONS,  
NUMERICAL ANALYSIS, DISTORTION, TURBULENCE

(U) Numerical Simulation of Unsteady Three-Dimensional  
Turbulent Structures in Boundary Layer Flows.

DESCRIPTIVE NOTE: Final rept. Nov 84-May 85.

IDENTIFIERS: (U) Hairpin vortices, PE81102F,  
WUAFOSR2307A1

MAY 85 45P

PERSONAL AUTHORS: Lui, Nan S. ; Shamroth, Stephen J. ;  
McDonald, Henry ;

REPORT NO. R85-910011-F

CONTRACT NO. F49620-84-C-0107

PROJECT NO. 2307

TASK NO. A1

MONITOR: AFOSR  
TR-85-1059

#### UNCLASSIFIED REPORT

**ABSTRACT:** (U) The capabilities for numerical simulations of the dynamical effects of the underlying structures occurring in turbulent boundary layers have been developed. A mathematically operational model of hairpin vortex, which closely resembles the experimentally observed underlying structure of wall turbulence, has been constructed and the evolution of this incipient hairpin vortex as well as the distortion of a background laminar boundary layer has been successfully simulated. The height of the incipient hairpin vortex is about  $1/5$  to the local boundary layer thickness. The calculated results not only exhibit most of the prominent features associated with turbulent spots and turbulent boundary layer flows, but also reveal dynamic processes which have been very difficult to observe in experimental studies, notably, the formation and intensification of another counter rotating hairpin vortex immediately upstream of the incipient hairpin vortex. Keywords: Navier-Stokes equations; Coherent wall structure.

**DESCRIPTORS:** (U) \*TURBULENT BOUNDARY LAYER, \*BOUNDARY LAYER FLOW, \*TURBULENT FLOW, THREE DIMENSIONAL FLOW, UNSTEADY FLOW, VORTICES, BACKGROUND, LAMINAR BOUNDARY

AD-A162 130

AD-A162 130

UNCLASSIFIED

PAGE 137

EVK551

## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 121 12/1

AD-A162 119 20/4 12/1

CORNELL UNIV ITHACA NY

OKLAHOMA UNIV NORMAN SCHOOL OF AEROSPACE MECHANICAL AND  
NUCLEAR ENGINEERING

(U) The Reliability of Load Sharing Systems.

(U) Optimization of Tip Store Modeling.

DESCRIPTIVE NOTE: Final technical rept. 1 Jun 84-31 May  
85,

DESCRIPTIVE NOTE: Final rept. May 83-Sep 84,

NOV 85 6P

MAR 85 105P

PERSONAL AUTHORS: Taylor, Howard M. ;

PERSONAL AUTHORS: Striz, Alfred G. ; Jang, Sun-Kuk ;

CONTRACT NO. AFOSR-84-0165

CONTRACT NO. AFOSR-83-0184

PROJECT NO. 2304

PROJECT NO. 2307

TASK NO. A5

TASK NO. A4

MONITOR: AFOSR  
TR-85-1098MONITOR: AFOSR  
TR-85-1089

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

ABSTRACT: (U) In a load sharing system, the failure of one or more components increases the load on other nonfailed components, thereby increasing their chances of failure, and the failure of the system. Examples of load sharing systems include many mechanical, thermal and electrical structures. System reliability is measured by the probability that the system is capable of performing its prescribed task or surviving for a prescribed duration. Traditional reliability models often postulate that component failures are statistically independent and, thus, do not describe load sharing systems. The optimal replacement theory for fault tolerant load sharing systems was developed under the support of the grant. As components fail, the system deteriorates. Where failed components cannot be replaced individually, and algorithm was found that determines the optimal policy for replacing the entire system.

DESCRIPTORS: (U) \*MATHEMATICAL MODELS, \*COMPOSITE MATERIALS, LOAD CONTROL, ALGORITHMS, FAILURE, SHARING, OPTIMIZATION, REPLACEMENT THEORY, RELIABILITY, ELECTRICAL PROPERTIES, STRUCTURES, SHARING, POLICIES, TIME, MODELS

IDENTIFIERS: (U) WJAFOSR2304A5, PE81102F

ABSTRACT: (U) Due to the high cost of performing detailed three-dimensional flutter analyses for aircraft which are carrying large numbers and types of external stores, it is often not economically feasible to include sophisticated store aerodynamics especially when they will not cause significant changes to the flutter results. Thus, the stores are presently often modeled as simple flat plates. This tends to decrease the accuracy of the computed pressure distributions as the spanwise flow field and the wing-body interaction are not represented correctly. In this report, therefore, two methods, a doublet lattice method for subsonic flow and a kernel function method for subsonic and supersonic flow are used for the computation of unsteady pressure distributions and forces on an F-5 wing with a tip mounted launcher/store combination for various store models consisting of simple flat plates, endplates, and axisymmetric bodies. The resulting aerodynamic data are compared to existing experimental and numerical results for the same wing/store combination. The store modeling was optimized for simplicity and accuracy with respect to the aerodynamic forces and pressures. The wing-body interaction was improved without a considerable increase in complexity, i. e. panel number, and thus computational effort. Keywords: Wing body configurations; Aerodynamic stability. (Author)

AD-A162 121

AD-A162 119

## UNCLASSIFIED

PAGE 138

EVK551



## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 119 CONTINUED

AD-A162 112 12/1 6/3 8/1

DESCRIPTORS: (U) \*WING TIPS, \*EXTERNAL STORES, \*FLUTTER, LOAD DISTRIBUTION, LAUNCHERS, MATHEMATICAL MODELS, JET FIGHTERS, SUPERSONIC FLOW, COMPUTATIONS, ACCURACY, AERODYNAMIC FORCES, AERODYNAMICS, AXISYMMETRIC, OPTIMIZATION, FLAT PLATE MODELS, AERODYNAMIC STABILITY, FLOW FIELDS, PANELS, SUBSONIC FLOW, WING BODY CONFIGURATIONS, INTERACTIONS

NORTH CAROLINA UNIV AT CHAPEL HILL DEPT OF STATISTICS  
(U) A Stochastic Population Model for Managing the Atlantic Menhaden (*Brevoortia tyrannus*) Fishery and Assessing Managerial Risks.

DESCRIPTIVE NOTE: Technical rept. Nov 82-Oct 83,

IDENTIFIERS: (U) Panel methods, WUAFOSR2307A4, PE61102F

85 10P

PERSONAL AUTHORS: Ruppert, D. ; Reish, R. L. ; Deriso, R. B. ; Carroll, R. J. ;

REPORT NO. MMS-1532

CONTRACT NO. F49620-82-C-0009

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-85-0984

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Canadian Jnl. of Fish. Aquat. Science, v42 p1371-1379 1985.

ABSTRACT: (U) A model including an age-structure, a stochastic egg-recruitment relationship, density-dependent juvenile growth, age-dependent fishing mortality, and fecundity dependent upon size as well as age was used to investigate three types of harvesting strategies: constant yearly catch policies, constant fishing mortality rate policies, and egg escapement policies, which are defined in the article. Because of stochastic recruitment, constant yearly catch policies appear unsuitable for managing Atlantic menhaden (*Brevoortia tyrannus*). Both other types of policies are suitable, but the egg escapement policies have higher long-term average catches. Using decision theory, we investigated risks due to the randomness of recruitment and to the estimation errors for the biological parameters in our model. The risks appear to be acceptable. (Author)

DESCRIPTORS: (U) \*MATHEMATICAL MODELS, \*FISHERIES,

AD-A162 119

AD-A162 112

UNCLASSIFIED

PAGE 139

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 111 CONTINUED

AD-A162 101 5/1 9/2

IOWA UNIV IOWA CITY APPLIED-OPTIMAL DESIGN LAB

DESCRIPTORS: (U) \*COMBUSTORS, \*RAMJET ENGINES, \*SUPERSONIC COMBUSTION, AIR INTAKES, AXIALLY SYMMETRIC FLOW, BOUNDARY LAYER, COMBUSTION, DIFFUSION, DUCTS, ENERGY TRANSFER, EXTERNAL, FLOW FIELDS, GAS GENERATING SYSTEMS, GROWTH(GENERAL), HEAT TRANSFER, HYPERSONIC CHARACTERISTICS, INLETS, INTERACTIONS, INTERNAL, ISOLATION, MASS, NAVIER STOKES EQUATIONS, NOZZLES, RADIUS(MEASURE), SHOCK WAVES, SKIN FRICTION, SUPERSONIC FLOW, TURBULENCE, VARIATIONS, NOZZLE GAS FLOW, JET MIXING FLOW, TURBULENT FLOW, HYPERSONIC FLOW

IDENTIFIERS: (U) Dual combustion ramjet engines, Hypersonic ramjet engines, PE81102F, WUAFOSR2308A2

(U) Database Design Methodology and Database Management System for Computer-Aided Structural Design Optimization.

DESCRIPTIVE NOTE: Interim technical rept. Jul-Dec 84,

DEC 84 144P

PERSONAL AUTHORS: Murthy, T. S.; Arora, J. S. ;

REPORT NO. CAD-SS-84-20

CONTRACT NO. AFOSR-82-0322

PROJECT NO. 2307

TASK NO. B1

MONITOR: AFOSR  
TR-85-1071

UNCLASSIFIED REPORT

ABSTRACT: (U) A study is made to integrate finite element-based-optimal structural design methods and computer-science methods into a computer-based system containing a database, a program library and man-machine communication link. Emphasis is placed upon database management concepts for structural design. Important components required to build a computer-aided structural design system are described. A number of database management concepts -- hierarchical, network and relational data models, conceptual, internal and external and external view of data organization, normalization of data, and integrity of database are discussed with reference to structural design data. A methodology to design a database are discussed with reference to structural design data. A methodology to design a database is proposed. Three levels of data organization, conceptual, internal and external are suggested. A methodology to construct a numerical data model is described. A numerical data model supports data of various types of large matrices such as banded, skyline and hyper matrices. Requirements of database management system and components needed to develop it are discussed. Keywords: MIDAS(Management of Information for Design and

AD-A162 111

AD-A162 101

UNCLASSIFIED

PAGE 141 EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 112

CONTINUED

AD-A162 111 21/2 21/8 20/4

BIOGRAPHIES, DECISION THEORY, DENSITY, EGGS, ERRORS, ESTIMATES, GROWTH(GENERAL), LONG RANGE(TIME), PARAMETERS, POLICIES, POPULATION, STOCHASTIC PROCESSES, RESOURCE MANAGEMENT, POPULATION(MATHEMATICS), ATLANTIC OCEAN, RISK, REPRINTS

JOHNS HOPKINS UNIV LAUREL MD APPLIED PHYSICS LAB

(U) Combustor/Inlet Interactions and Modeling of Hypersonic Dual Combustor Ramjet Engines.

DESCRIPTIVE NOTE: Final rept. Oct 83-Sep 84,

IDENTIFIERS: (U) Menhaden, WUAFO5R2304A5, PE81102F

NOV 84 57P

PERSONAL AUTHORS: Stockbridge, Richard D. ; Schetz, Joseph A. ; Waltrup, Paul J. ; Billig, Frederick S. ;

CONTRACT NO. AFOSR-MIPR-84-00001

PROJECT NO. 2308

TASK NO. A2

MONITOR: AFOSR  
TR-85-1063

UNCLASSIFIED REPORT

ABSTRACT: (U) The purpose of this research has been to experimentally and analytically describe the inlet/combustor/exit nozzle flowfields in hypersonic DCR (Dual combustion Ramjet) engines. The experimental effort to date describes, in part, the flow characteristics in the isolator duct that conducts air supersonically from the external flowfield of the hypersonic air inlet to the supersonic combustor. This description includes the mean flow properties, the turbulent fluctuation flow properties, the boundary layer growth and the simulated precombustion compression field for an initial Mach 2.4 flow in a 20-in. long annular duct with inner and outer radii of 3.125 and 4.2 in., respectively. The analytical effort includes models that describe: (1) the recirculation region at the DCR gas generator base created by a surrounding supersonic jet; (2) the mixing and burning processes in the DCR supersonic combustor; (3) the supersonic combustor boundary layer; and (4) the nozzle flow. The models include such enhancements as finite rate, multiple species chemistry, the solution of the full Navier-Stokes equations for axisymmetric flow and energy transfer due to mass diffusion. Keywords: Combustor/inlet interactions; Shock boundary layer interactions; Skin friction and heat transfer; Mixing and combustion; Supersonic combustion.

AD-A162 112

AD-A162 111

UNCLASSIFIED

PAGE 140

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 101 CONTINUED

AD-A162 096 20/12 20/6

Analysis of System).

MASSACHUSETTS INST OF TECH CAMBRIDGE

DESCRIPTORS: (U) \*MANAGEMENT INFORMATION SYSTEMS, \*DATA BASES, \*DATA MANAGEMENT, \*MANAGEMENT PLANNING AND CONTROL, COMMUNICATIONS NETWORKS, COMPUTER AIDED DESIGN, COMPUTER APPLICATIONS, MAN MACHINE SYSTEMS, MATHEMATICAL MODELS, METHODOLOGY, MODELS, NORMALIZING(STATISTICS), OPTIMIZATION, STRUCTURAL ENGINEERING

(U) Infrared Nonlinear Processes in Semiconductors.

DESCRIPTIVE NOTE: Semiannual technical rept. 1 Dec 84-31 May 85.

JUN 85 7P

IDENTIFIERS: (U) PE61102F, WUAFOSR2307B1

PERSONAL AUTHORS: Wolff, P. A. ; Aggarwal, R. L. ; Larsen, D. M. ; Yuen, S. Y. ; Isaacs, E. ;

CONTRACT NO. F49620-84-C-0010

PROJECT NO. 2306

TASK NO. C2

MONITOR: AFOSR  
TR-85-0994

UNCLASSIFIED REPORT

ABSTRACT: (U) Observation of exceedingly narrow spin flip lines in n-InSb suggests the existence of spin waves in this crystal. Si:P has been shown to have a large nonlinear optic coefficient at the metal-insulator transition; the effect is believed to be due to electron promotion from localized to delocalized states. Preliminary nonlinear optic experiments imply that hole kinetics in p-type InGaAs/GaAs strained layer superlattices are different from those of bulk p-GaAs. (Author)

DESCRIPTORS: (U) \*GALLIUM ARSENIDES, \*P TYPE SEMICONDUCTORS, \*NONLINEAR SYSTEMS, \*INFRARED RADIATION, BULK MATERIALS, COEFFICIENTS, ELECTRONS, INSULATION, METALS, OPTICS, PROMOTION(ADVANCEMENT), SPINNING(MOTION), TRANSITIONS, WAVES

AD-A162 101

AD-A162 096

UNCLASSIFIED

PAGE 142

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 095 CONTINUED

AD-A162 095 12/2 5/11

SRI INTERNATIONAL MENLO PARK CA ARTIFICIAL INTELLIGENCE CENTER

Interact with the real world (e.g., those installed on a robot vehicle). This has compelled us to add extensions to SIPE.

(U) Research on Problem-Solving Systems.

DESCRIPTIVE NOTE: Interim rept. 1 Oct 84-30 Sep 85.

OCT 85 26P

DESCRIPTORS: (U) \*SYSTEMS ENGINEERING, \*PLANNING, \*PROBLEM SOLVING, MONITORING, HIERARCHIES, LOW LEVEL, HEURISTIC METHODS, INTERACTIONS, REASONING, DETECTORS

IDENTIFIERS: (U) LPN-SRI-7898, PE81102F, WUAFOSR2304A7

PERSONAL AUTHORS: Wilkins, David E. ;

CONTRACT NO. F49620-85-K-0001

PROJECT NO. 2304

TASK NO. A7

MONITOR: AFOSR  
TR-85-1091

UNCLASSIFIED REPORT

ABSTRACT: (U) Research on planning and problem-solving systems was begun at SRI International in September 1979 under AFOSR sponsorship. The present report describes the research conducted during the past year. This program developed powerful methods of representing, generating, and executing hierarchical plans that contain parallel actions. Execution involves monitoring the state of the world and, possibly, replanning if things do not proceed as expected. Over the last few years SRI has designed and implemented a system, called SIPE (System for Interactive Planning and Execution Monitoring), the purpose of which is to demonstrate the heuristic adequacy of our approach to this problem. SRI's basic approach is to work within the heuristic-planning methodology, representing plans in procedural networks - as has been done in NOAH7 and other systems. Several extensions of previous planning systems have been implemented, including the development of a conspicuous formalism for describing operators and objects, the use of constraints for the partial description of objects, the creation of mechanisms that permit concurrent exploration of alternative plans, the incorporation of heuristics for reasoning about resources, and an implementation of a deductive capability. Research this year has concentrated on interfacing the abstract, high-level plans produced by SIPE with the low-level information used by the sensors and effectors that might

AD-A162 095

AD-A162 095

UNCLASSIFIED

PAGE 143

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 091 CONTINUED

AD-A162 091 7/4 7/3

TEXAS UNIV AT AUSTIN DEPT OF CHEMISTRY

(U) Thermolysis of Molecules Containing NO<sub>2</sub> Groups,  
IDENTIFIERS: (U) MINDO(Modified Intermediate Neglect of  
Differential) Overlap), PE81102F, WUAFDSR230382

85 8P

PERSONAL AUTHORS: Dewar, Michael J. S.; Ritchie, James P.;  
Alister, Jack;

CONTRACT NO. F49620-83-C-0024, DAAG29-81-C-0008

PROJECT NO. 2303

TASK NO. 82

MONITOR: AFOSR  
TR-85-1010

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Organic Chemistry,  
V50 n7 p1031-1038 1985.

ABSTRACT: (U) MINDO/3 calculations are reported for the thermal decomposition of nitromethane, methyl nitrite, methyl nitrate, nitroethylene, 1-1-dinitroethylene, cis-1, 2-dinitroethylene, tetranitroethylene, nitroacetylene, and dinitroacetylene. The nitro compounds decompose most easily by first rearranging to isomeric nitrites. Methyl nitrite and methyl nitrate can decompose by fission into radicals (CH<sub>3</sub> + NO or NO<sub>2</sub>) or by alternative routes involving cyclic elimination (CH<sub>3</sub>ONO yields CH<sub>2</sub> + HONO) or intermolecular transfer of oxygen (CH<sub>3</sub>ONO<sub>2</sub> + HCH<sub>2</sub>ONO<sub>2</sub> yields CH<sub>3</sub>ONO + HCH<sub>2</sub>ONO<sub>2</sub>). In the case of methyl nitrate, the latter alternative is likely to be favored under the conditions of a detonation shock wave. The activation energies calculated for the nitro yields nitrite rearrangements of tetranitroethylene and of dinitroacetylene suggest that neither will be thermally stable.

DESCRIPTORS: (U) \*NITRO RADICALS, \*PYROLYSIS, \*ORGANIC NITROGEN COMPOUNDS, ACETYLENE, ACTIVATION ENERGY, DETONATION WAVES, ETHYLENE, ELIMINATION REACTIONS, QUANTUM THEORY, FISSION, ISOMERS, METHYL RADICALS, MOLECULE MOLECULE INTERACTIONS, NITRATES, NITRITES, NITROGEN COMPOUNDS, NITROMETHANE, OXYGEN, PYROLYSIS, SHOCK WAVES, TRANSFER, YIELD, REPRINTS

AD-A162 091

AD-A162 091

UNCLASSIFIED

PAGE 144

EVK551

## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 086

9/2

IOWA UNIV IOWA CITY APPLIED-OPTIMAL DESIGN LAB

(U) Specification for MIDAS-GR Management of Information  
for Design and Analysis of System. Generalized  
Relational Model.

DESCRIPTIVE NOTE: Interim technical rept. Jul-Dec 84.

DEC 84

92P

PERSONAL AUTHORS: Arora, J. S. ; Mukhopadhyay, S. ;

REPORT NO. CAD-SS-84.24

CONTRACT NO. AFOSR-82-0322

PROJECT NO. 2307

TASK NO. B1

MONITOR: AFOSR  
TR-85-1062

## UNCLASSIFIED REPORT

**ABSTRACT:** (U) This report presents specification of a database management system currently under development. It is specifically designed to meet the requirements of engineering applications. The stress in design lies on the flexibility of data definition capabilities, efficient management of large volume of I/O, and dynamic creation and deletion of data objects. In data definition the system takes unified approach for relational and numerical data models. It also defines a set of frequently used special data types (sparse matrix etc.) and provides uniform data structure for their efficient manipulation. The system also provides powerful data language which can be used directly from a terminal on ad hoc basis or from a host programming language. This language is non-procedural; so for a large class of problems user need not resort to branching or loops. Also, since it is precompiled instead of being interpreted at run time, it is inherently much faster. It is expected that this system will play central role in design and implementation of future systems in design optimization area. (Author)

DESCRIPTORS: (U) \*DATA BASES, \*SYSTEMS ENGINEERING.

AD-A162 086

AD-A162 086

## UNCLASSIFIED

PAGE 145

EVK551

AD-A162 086 CONTINUED

\*SPECIFICATIONS, LANGUAGE, DYNAMICS, MANAGEMENT,  
OPTIMIZATION, REQUIREMENTS, DATA MANAGEMENT, MANAGEMENT  
INFORMATION SYSTEMS, MATHEMATICAL MODELS, USER NEEDS,  
INPUT OUTPUT PROCESSING

IDENTIFIERS: (U) PEG1102F, WUAFOSR2307B1

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 078

7/2

7/3

7/4

AD-A162 078

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STATE UNIV OF NEW YORK AT BUFFALO DEPT OF CHEMISTRY

(U) Electrochemical Reduction of N-(1-Butyl)pyridinium  
Cation in 1-Methyl-3-Ethylimidazolium Chloride-  
Aluminum Chloride Ambient Temperature Ionic Liquids.

IDENTIFIERS: (U) Chloroaluminates, PE81102F,  
WUAFOSR2303A1

84

6P

PERSONAL AUTHORS: Lipsztajn, M.; Osteryoung, R. A. ;

CONTRACT NO. AFOSR-84-0292

PROJECT NO. 2303

TASK NO. A1

MONITOR: AFOSR  
TR-85-0915

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Electrochimica Acta, v29 n10  
p1349-1352 1984.

ABSTRACT: (U) The reduction of N-(1-butyl)pyridinium  
cation (BuPy+) has been studied in the ambient  
temperature liquid, 1-methyl-3-ethylimidazolium chloride  
(ImCl)-aluminum chloride. A one-electron wave with  
convective-diffusion controlled limiting current was  
observed and the diffusion coefficients of BuPy+ were  
measured in neutral and basic (MC = 0.6) ImCl-AlCl3 melts.  
The D sub n T product was found to be almost independent  
of melt composition. E sub 1/2 and peak potentials  
measured in neutral and basic melts were practically  
independent of melt composition; however a small but  
significant shift to less negative potentials was  
observed in the absence of chloride ions (ie in pure  
ImAlCl4). This effect was attributed to ion pair  
formation (BuPy+-Cl-). Coulometry indicated an n value of  
1 for the reduction to the BuPy+ cation. About 15% of the  
primary product was transformed into the electroactive  
viologens. (Author)

DESCRIPTORS: (U) \*ALUMINUM COMPOUNDS, \*CHLORIDES,  
\*ELECTROCHEMISTRY, IONS, DIFFUSION COEFFICIENT, MELTING,  
NEUTRAL, LIQUIDS, TEMPERATURE, COULOMETERS, REDUCTION,  
IONS, VOLTAMMETRY, REPRINTS

AD-A162 078

AD-A162 078

UNCLASSIFIED

PAGE 148

EVK551



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 077 7/2 7/3 7/4 AD-A162 077 CONTINUED

STATE UNIV OF NEW YORK AT BUFFALO DEPT OF CHEMISTRY

IONS, VOLTAMMETRY, REPRINTS

(U) Electrochemistry in Neutral Ambient-Temperature Ionic Liquids. 1 Studies of Iron (III), Neodymium (III), and Lithium(I).

IDENTIFIERS: (U) Chloroaluminates, WUAFOSR2303A1, PE81102F

85 6P

PERSONAL AUTHORS: Lipsztajn, Marek ; Osteryoung, Robert A. ;

CONTRACT NO. AFOSR-84-0292

PROJECT NO. 2303

TASK NO. A1

MONITOR: AFOSR  
TR-85-0914

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Inorganic Chemistry, v24 p718-719 1985.

ABSTRACT: (U) An ambient-temperature 'neutral' ionic liquid composed of aluminum chloride and either N-1-butylpyridinium or 1-methyl-3-ethylimidazolium chloride, BuPyCl or ImCl, respectively, has been employed in studies that take advantage of their unusual properties. These include an extended electrochemical window, readily controlled additions of excess chloride (base) or aluminum chloride (acid), and the fact that the physical properties of the 'neutral' melt do not change about the 1:1 mole ratio of AlCl<sub>3</sub> to RCl. Li(+) was found to be reducible in the 'neutral' AlCl<sub>3</sub>-ImCl melt, and its diffusion coefficient was found to be .0000086 sq cm/s. The stoichiometry of the complex formed between Nd(III) and Cl(+) in the molten salt system was investigated by what is essentially an amperometric titration and was found to be NdCl<sub>6</sub>(3-). The structure of the Fe(III) chloro complex that exists in basic or acidic melts just slightly varying in composition from the neutral melt was also investigated; a constant value for the diffusion coefficient-viscosity product in both systems suggests no change in structure.

DESCRIPTORS: (U) \*ELECTROCHEMISTRY, \*IRON, \*NEODYMIUM, \*LITHIUM, IONS, LIQUIDS, SALTS, STOICHIOMETRY, COMPLEX

AD-A162 077

AD-A162 077

UNCLASSIFIED

PAGE 147

EVK551

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 076

7/2

7/3

7/4

AD-A162 075

7/2

7/3

7/4

## STATE UNIV OF NEW YORK AT BUFFALO DEPT OF CHEMISTRY

## STATE UNIV OF NEW YORK AT BUFFALO DEPT OF CHEMISTRY

(U) Electrochemical Studies of Ferrocene and Ferrocenium Ion in Aluminum Chloride-N-1-Butylpyridinium Chloride Ionic Liquid.

(U) Electrochemical Studies of Iodine in an Aluminum Chloride-Butylpyridinium Chloride Ionic Liquid. Part 2. Neutral and Basic Solvent Composition.

84

9P

84

16P

PERSONAL AUTHORS: Karpinski, Zenon J.; Nanjundiah, Chenniah; Osteryoung, Robert A.;

PERSONAL AUTHORS: Karpinski, Zenon J.; Osteryoung, Robert A.

CONTRACT NO. AFOSR-84-0292

CONTRACT NO. AFOSR-84-0292

PROJECT NO. 2303

PROJECT NO. 2303

TASK NO. A1

TASK NO. A1

MONITOR: AFOSR

MONITOR: AFOSR

TR-85-0911

TR-85-0913

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Inorganic Chemistry, v23 n21 p3358-3364 1984.

SUPPLEMENTARY NOTE: Pub. in Jnl. of Electroanalytical Chemistry, v178 p281-294 1984. See also AD-A149 581.

ABSTRACT: (U) Electrochemical studies of the ferrocene/ferrocenium ion system have been carried out in AlCl<sub>3</sub>-N-1-butylpyridinium chloride ionic liquid at 40 °C as a function of melt composition. The ferrocene/ferrocenium electron-transfer process is reversible, and the formal potential of the ferrocene/ferrocenium cation couple varies only slightly with wide changes of solvent acidity. Ferrocene and ferrocenium ion are both stable in neutral butylpyridinium tetrachloroaluminate. In basic (excess BuPyCl) melts ferrocene is stable, while the ferrocenium cation is decomposed by Cl(-) to Fe(Cp)<sub>2</sub> and FeCl<sub>4</sub>. In acidic (excess AlCl<sub>3</sub>) melts ferrocene is oxidized to ferrocenium ion by traces of oxygen and reacts with products of the reaction of water with the solvent. The ferrocenium cation is stable in the acid melts.

DESCRIPTORS: (U) \*ELECTROCHEMISTRY, ALUMINUM COMPOUNDS, \*CHLORIDES, \*FERROCENES, SALTS, IONS, VOLTAMMETRY, ACID BASE EQUILIBRIUM, LIQUIDS, REPRINTS

IDENTIFIERS: (U) Butylpyridinium Chloride, Chloroaluminates, PE61102F, WUAFOSR2303A1

AD-A162 076

AD-A162 075

## UNCLASSIFIED

PAGE 148

EVK551

ABSTRACT: (U) The electrochemical behavior of iodine in an ambient temperature molten salt system, aluminum chloride-N-(1-butyl)pyridinium chloride (BuPyCl), have been studied in basic (excess BuPyCl) and neutral (1.0:1.0 AlCl<sub>3</sub>:BuPyCl mole ratio) melt compositions. Acid-base interactions of iodine in different oxidation states with the ionic solvent are observed. High stability of triiodide ion in neutral butylpyridinium tetrachloroaluminate indicates relatively weak intermolecular interactions in this solvent. In basic solutions polyhalogen equilibria involving iodine in different oxidation states and chloride ions are established. In iodine and tetraethylammonium triiodide solutions a mixture of ICl<sub>2</sub> ICl<sub>3</sub> and I<sup>-</sup> ions forms. The formation constants of ICl<sub>2</sub><sup>-</sup> and ICl<sub>3</sub><sup>-</sup> and the equilibrium constant for ICl<sub>2</sub> disproportionation are estimated. (Author)

DESCRIPTORS: (U) \*ELECTROCHEMISTRY, \*IODINE, \*ALUMINUM COMPOUNDS, \*CHLORIDES, ACID BASE EQUILIBRIUM, SALTS, IONS, VOLTAMMETRY, INTERACTIONS, REPRINTS

IDENTIFIERS: (U) Chloroaluminates, Butylpyridinium

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A182 075 CONTINUED

AD-A182 074 8/15 8/20

Chloride, WUAFOSR2303A1, PE81102F

VANDERBILT UNIV NASHVILLE TN DEPT OF CHEMISTRY

(U) Quantum Theoretical Determination of the Molecular Structure of some Anticholinesterase Agents,

NOV 83 12P

PERSONAL AUTHORS: Ewig, Carl S. ;

CONTRACT NO. AFOSR-82-0100

PROJECT NO. 2303

TASK NO. 82

MONITOR: AFOSR  
TR-85-0898

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in the Proceedings of the Scientific Conference on Chemical Defense Research, p159-167, 14-18 Nov 83.

ABSTRACT: (U) We describe a systematic procedure for computing the structures, particularly the conformations, of some organophosphorus anticholinesterase compounds. The structure of methylphosphonyldifluoride was computed and compared with experimental data as a test. Using the results plus standard structural parameters, based largely on our computed structure of the nerve agent prototype O-methyl methylphosphonofluoridate, the conformations of the O-ethyl ester, the O-isopropyl ester (sarin, GB) and O-pinacolyl ester (soman, GD) were derived. In all cases a unique conformation results with the first carbon and one hydrogen atom eclipsed to the phosphoryl oxygen atom. (Author)

DESCRIPTORS: (U) \*CHOLINESTERASE INHIBITORS, \*GB AGENT, \*GD AGENT, \*ORGANIC PHOSPHORUS COMPOUNDS, DETERMINATION, ATOMS, CARBON, HYDROGEN, MOLECULAR STRUCTURE, CONFORMITY, PARAMETERS, QUANTUM THEORY, STRUCTURAL PROPERTIES

IDENTIFIERS: (U) WUAFOSR2303B2, PE81102F

AD-A182 075

AD-A182 074

UNCLASSIFIED

PAGE 149 EVK551

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 073

7/3

AD-A162 069

12/1

UNIVERSITY OF SOUTHERN CALIFORNIA LOS ANGELES DEPT OF CHEMISTRY

PITTSBURGH UNIV PA CENTER FOR MULTIVARIATE ANALYSIS

(U) Adamantylidimethylsilyl Ethers.

85

13P

PERSONAL AUTHORS: Vanek, Erich ; Pai, Yi-Ming ; Weber, William P.

DESCRIPTIVE NOTE: Technical rept..

AUG 85 20P

CONTRACT NO. AFOSR-82-0333

PERSONAL AUTHORS: Fujikoshi, Y. ; Krishnalah, P. R. ; Schmidhammer, J. ;

PROJECT NO. 2303

REPORT NO. TR-85-31

TASK NO. B2

CONTRACT NO. F49620-85-C-0008, F49620-82-K-0001

MONITOR: AFOSR TR-85-0897

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR TR-85-0980

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Synthetic Communications, v15 n3 p185-194 1985.

ABSTRACT: (U) Adamantylidimethylsilyl ethers, prepared by reaction of the chloride with alcohols in DMF/imidazole or by Ph3P3RHC catalyzed reaction of adamantylidimethylsilane with alcohols, are comparable in stability to t-butylidimethylsilyl ethers. Their hydrolysis yields the alcohol and adamantanylidimethylsilanol. Methods to convert the silanol back to the chloride or silane are given.

Keywords: reprints. (Author)

DESCRIPTORS: (U) \*ADAMANTANES, \*ETHERS, \*SILANES, ALCOHOLS, HYDROLYSIS, YIELD, REPRINTS, CHLORIDES

IDENTIFIERS: (U) WUAFOSR2303B2, PE61102F

ABSTRACT: (U) In this paper, the authors derived asymptotic distributions of changes in certain functions of the eigenvalues of the sample covariance matrix, MANOVA matrix and canonical correlation matrix when some variables are added to the original sets of variables. The above results are useful in finding out as to whether the new variables give additional information for statistical inference; multivariate analysis; Wishart distribution. (Author)

DESCRIPTORS: (U) \*ANALYSIS OF VARIANCE, \*VARIABLES, CORRELATION, DISCRIMINATE ANALYSIS, FUNCTIONS, MULTIVARIATE ANALYSIS, STATISTICAL INFERENCE, EIGENVALUES, COVARIANCE, WISHART MATRICES, MATRICES(MATHEMATICS)

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A5

AD-A162 073

AD-A162 069

## UNCLASSIFIED

PAGE 150

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A162 068 9/5 20/12

AD-A162 068 CONTINUED

RENSELAER POLYTECHNIC INST TROY NY DEPT OF MECHANICAL  
ENGINEERING AERONAUTICAL ENGINEERING AND MECHANICS

(U) Analytical Investigations of Bulk Wave Resonators in  
the Piezoelectric Thin Film on Gallium-Arsenide  
Configuration.

DESCRIPTIVE NOTE: Annual rept. 1 Sep 84-31 Aug 85.

SEP 85 10P

PERSONAL AUTHORS: Tiersten, Harry F. ;

CONTRACT NO. AFOSR-84-0351

PROJECT NO. 2306

TASK NO. 82

MONITOR: AFOSR  
TR-85-1042

UNCLASSIFIED REPORT

ABSTRACT: (U) Trapped energy modes in the piezoelectric thin film on semiconductor composite resonator are explained and contrasted with modes that do not trap energy. The results of calculation of the quality factor of the fundamental essentially thickness-extensional mode in the composite resonator due to radiation into the bulk semiconductor wafer are discussed. The calculations were performed for two configurations of the composite resonator thick in which the mode is not trapped and for a configuration in which the mode is trapped. The combination of materials was aluminum-nitride on gallium-arsenide. The calculations show that when trapping is not present the quality factor is a very rapidly varying function of the ratio of the composite resonator thickness to the wafer thickness and that the range of variation is very large, i.e., between one and two orders of magnitude. The calculations also reveal that when trapping is present the quality factor is always much larger and its range of variation with thickness ratio much smaller than when trapping is not present. Keywords include: Piezoelectricity; Elasticity; Resonators; Bulk waves; Thin films; Semiconductor wafers; Composite resonators; Energy trappings; Radiation; Quality factor; and Plate vibrations.

AD-A162 068

AD-A162 068

UNCLASSIFIED

PAGE 151

EVK551

DESCRIPTORS: (U) \*RESONATORS, \*GALLIUM ARSENIDES, \*WAFERS, \*BULK SEMICONDUCTORS, CONFIGURATIONS, ELASTIC PROPERTIES, ENERGY, MATERIALS, PIEZOELECTRIC MATERIALS, PIEZOELECTRICITY, QUALITY, RATIOS, THIN FILMS, THICKNESS, THIN FILMS, TRAPS, VARIATIONS, WAVE PROPAGATION

IDENTIFIERS: (U) WJAFOSR2304B2, PE61102F

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A182 063 8/13

AD-A182 063 CONTINUED

HYDROSPACE RESEARCH CORP ROCKVILLE MD PHYSICAL ACOUSTICS  
DIV

(U) Three-Dimensional Elasto-Plastic Analysis for Soils.

DESCRIPTIVE NOTE: Annual rept. 15 Jun-14 Aug 85.

SEP 85 170P

PERSONAL AUTHORS: Blandford, George E.; Hardin, Bobby O.;

CONTRACT NO. AFOSR-84-0195

PROJECT NO. 2307

TASK NO. C1

MONITOR: AFOSR  
TR-85-1090

UNCLASSIFIED REPORT

ABSTRACT: (U) This report presents the first year accomplishments perfecting the elasto-plastic soil constitutive equations of Hardin (1978) and their implementation into EPSAP (Elasto-Plastic Soil Analysis Program). The elasto-plastic soil constitutive equations reflect the essential features of soil behavior that result from the soil skeleton being particulate. Constitutive equation modeling improvements include: (1) crushing of soil particles, (2) strength of soils in terms of effective stress, and (3) modification of the class 1 plastic potential function. EPSAP is a three-dimensional finite element code which is being developed as part of the research. The developments for EPSAP include expressing the two classes of soil loading in matrix form and their subsequent finite element implementation. EPSAP includes a three node line load element, six node triangular and eight node quadrilateral surface load elements, and fifteen node prism and twenty node hexahedron domain elements. A predictor-corrector solution algorithm for solving the nonlinear equation and the out-of-core nonsymmetric skyline solver are discussed. Results for a triaxial compression simulation are presented. Keywords: Elasto-plastic; Finite element; Nonlinear; Soils; Three-dimensional.

DESCRIPTORS: (U) \*SOIL MODELS, \*SOIL MECHANICS,

AD-A182 063

AD-A182 063

UNCLASSIFIED

PAGE 152

EVK551

PARTICULATES, MATHEMATICAL MODELS, COMPUTER PROGRAMS, LOADS(FORCES), ALGORITHMS, NONLINEAR ANALYSIS, STRENGTH(MECHANICS), CRUSHING, PARTICLES, SOILS, ELASTIC PROPERTIES, PLASTIC PROPERTIES, SOIL TESTS, FINITE ELEMENT ANALYSIS, EQUATIONS, NONLINEAR SYSTEMS, EQUATIONS, MODELS, NODES, SKELETON, MATHEMATICAL ANALYSIS, THREE DIMENSIONAL, COMPRESSION, SIMULATION, TRIAXIAL STRESSES

IDENTIFIERS: (U) EPSAP(Elastoplastic Soil Analysis Program), Elastoplasticity, PEB1102F, WUAFOSR2307C1

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 029 14/4 15/5

AD-A162 027 20/11 12/1

CITY COLL NEW YORK DEPT OF MATHEMATICS

SOUTHWEST RESEARCH INST SAN ANTONIO TX

(U) Reliability Assessment for Systems Subject to Maintenance and Repair.

(U) Nonlinear Fracture Mechanics Analysis with the Boundary Integral Method.

DESCRIPTIVE NOTE: Annual rept. 1 Apr 84-30 Jun 85.

DESCRIPTIVE NOTE: Annual technical rept. 2 Apr 84-29 Mar 85.

AUG 85 9P

APR 85 36P

PERSONAL AUTHORS: Brown, Mark ;

PERSONAL AUTHORS: Cruse, T. A. ; Polch, E. Z. ;

CONTRACT NO. AFOSR-84-0095

CONTRACT NO. F49620-84-C-0042

PROJECT NO. 2304

PROJECT NO. 2302

TASK NO. A5

TASK NO. B2

MONITOR: AFOSR  
TR-85-1084MONITOR: AFOSR  
TR-85-1072

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The main thrust of the research under this grant is to develop the methodology to deal with more realistic models for the quantitative reliability assessment and analysis of complex systems. Inequalities for increasing failure rate distributions have been derived. A new theory of age-weighted distributions is being developed. Work is beginning on exploiting properties of a partial ordering of distribution. Keywords: Reliability modeling; Age-weighted distributions; Repairable systems.

ABSTRACT: (U) The current research makes use of the boundary integral equation (BIE) method, as modified to account exactly for the elastic crack problem. The usual BIE formulation for elastic problems reduces the numerical problem to one of modeling the boundary data, while preserving the complete interior solution of the field equations. In the elastic fracture mechanics problem, the Green's function approach is used wherein the BIE is modified to account for the presence of a stress free crack at an arbitrary location within the structure. The use of the Green's function for the crack eliminates the need to model the boundary of the crack, and provides a complete mathematical description of the elastic strain field within the body, due to the crack. This clearly contrasts with the finite element method which requires that the crack surface and the interior strains be modeled with some set of interpolation functions. However, extension of the fracture mechanics model with the Green's function approach has not been previously demonstrated. The current work reports on the successful extension of the special Green's function formulation for the fracture mechanics problem to the elastoplasticity formulation. Not only has the work resulted in accurate models of crack tip plasticity for a reference problem, but it has shown some important new

DESCRIPTORS: (U) \*RELIABILITY, \*REPAIR, \*MAINTENANCE, DISTRIBUTION, FAILURE, MODELS, RATES, TEST AND EVALUATION, THEORY, METHODOLOGY

IDENTIFIERS: (U) PEB1102F, W1AFOSR2304A5

AD-A162 029

AD-A162 027

UNCLASSIFIED

PAGE 153

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 027 CONTINUED

AD-A162 021 20/2 20/12

analytical and numerical results for cracks growing in plastic strain fields. (Author)

CORNELL UNIV ITHACA NY SCHOOL OF ELECTRICAL ENGINEERING

DESCRIPTORS: (U) \*INTEGRAL EQUATIONS, \*FRACTURE(MECHANICS), \*CRACK PROPAGATION, BOUNDARIES, CRACKS, ELASTIC PROPERTIES, FINITE ELEMENT ANALYSIS, FORMULATIONS, FUNCTIONS, GREENS FUNCTION, GROWTH(GENERAL), INTERNAL, INTERPOLATION, NONLINEAR ANALYSIS, NUMERICAL ANALYSIS, PLASTIC PROPERTIES, SOLUTIONS(GENERAL), STRAIN(MECHANICS), STRESSES, SURFACES, MATHEMATICAL MODELS

(U) Microwave Semiconductor Research Materials, Devices and Circuits.

DESCRIPTIVE NOTE: Annual technical rept. 1 May 84-30 Apr 85,

OCT 85 38P

PERSONAL AUTHORS: Eastman, L. F.; Woodard, D. W.; Mukherjee, S. D.; Wicks, G. W.; Ballantyne, J. W.;

IDENTIFIERS: (U) BIE(Boundary Integral Equation), Elastoplasticity, Crack tips, LPN-SWRI-08-8044, PE81102F, WJAFOSR230282

CONTRACT NO. F49620-84-C-0060

PROJECT NO. 2305

TASK NO. A9

MONITOR: AFOSR  
TR-85-1024

UNCLASSIFIED REPORT

ABSTRACT: (U) This program covers the growth and assessment of gallium arsenide and related compounds and alloys for use in microwave, millimeter wave, and optical devices. It also covers the processing of the material into devices, the testing of the devices, and the theoretical modeling of carrier transport in these devices. Both molecular beam epitaxy (MBE) and organometallic vapor phase epitaxy (OMVPE) are used for growth.

DESCRIPTORS: (U) \*SEMICONDUCTOR DEVICES, \*EPITAXIAL GROWTH, \*GALLIUM ARSENIDES, CHARGE CARRIERS, MICROWAVE EQUIPMENT, MODEL THEORY, MILLIMETER WAVES, ALLOYS, MOLECULAR BEAMS, OPTICAL EQUIPMENT, ORGANOMETALLIC COMPOUNDS, PROCESSING, SEMICONDUCTORS, TEST AND EVALUATION, TRANSPORT PROPERTIES, VAPOR PHASES, MATERIALS

IDENTIFIERS: (U) PE81102F, WJAFOSR2305A9

AD-A162 027

AD-A162 021

UNCLASSIFIED

PAGE 184

EVK551



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A162 020 7/4 7/3

IOWA UNIV IOWA CITY DEPT OF CHEMISTRY

(U) New Approaches to the Synthesis of Fluorocarbons.

DESCRIPTIVE NOTE: Final rept. 15 Jul 84-14 Jul 85.

OCT 85 12P

PERSONAL AUTHORS: Burton, Donald J. ;

CONTRACT NO. AFOSR-84-0245

PROJECT NO. 2917

TASK NO. A2

MONITOR: AFOSR  
TR-85-1027

UNCLASSIFIED REPORT

ABSTRACT: (U) This grant was issued under the DOD University Research Instrumentation for the purpose of upgrading equipment at the universities in order to perform research in support of National Defense. The instrument acquired was a Jeol FX-90Q(II) Fourier Transform (FT) Multi-Nuclear Magnetic Resonance Spectrometer System with the 'Omni Probe'. The instrument also contains variable temperature observation, internal and external lock systems and computer control of irradiation frequencies.

DESCRIPTORS: (U) \*FLUORINATED HYDROCARBONS, \*SYNTHESIS(CHEMISTRY), \*FOURIER SPECTROMETERS, INSTRUMENTATION, IRRADIATION, NATIONAL DEFENSE, OBSERVATION, FREQUENCY, OMNIDIRECTIONAL, PROBES, TEMPERATURE, COMPUTERS, CONTROL, MILITARY RESEARCH, NUCLEAR MAGNETIC RESONANCE, FOURIER SPECTROSCOPY, UNIVERSITIES

IDENTIFIERS: (U) PEB1102F, WUAFOSR2917A2

AD-A162 020

UNCLASSIFIED

AD-A161 994 7/5 7/4

SRI INTERNATIONAL MENLO PARK CA

(U) Laser-Induced Kinetics: An Experimental and Theoretical Program.

DESCRIPTIVE NOTE: Final rept. 1 Oct 82-30 Sep 85.

OCT 85 78P

PERSONAL AUTHORS: Selamoglu, N. ; Rossi, M. J. ; Golden, D. M.

CONTRACT NO. F49620-83-K-0001

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-85-1097

UNCLASSIFIED REPORT

ABSTRACT: (U) The kinetics of CF3 and CH3 radical reactions have been investigated using the VLP0 method. The reactions of interest were radical recombination and metathetical halogenation (Br2, Cl2). In addition to yielding gas-phase reaction rates, these studies pointed out the importance of gas-surface interactions in the chemistry. The VLP0 technique was also used to investigate a radical-surface reaction: the reaction of the CF3 radicals on a silicon oxide surface. The latter study revealed that H2O on the surface plays a major role in the chemistry. The surface reaction was studied as functions of surface temperature (320-530 K) and CF3 concentration. Keywords: Very low-pressure pyrolysis; Laser induced kinetics; Radical surface chemistry; Chlorine; Bromine; Fluorine; and Methane.

DESCRIPTORS: (U) \*GAS SURFACE INTERACTIONS, \*CHEMICAL RADICALS, \*HALOGENATION, \*RECOMBINATION REACTIONS, \*PYROLYSIS, \*PHOTOCHEMICAL REACTIONS, BROMINE, CHEMISTRY, CHLORINE, KINETICS, LASERS, LOW PRESSURE, METHANE, OXIDES, SILICON COMPOUNDS, SURFACE REACTIONS, SURFACE TEMPERATURE, SURFACES

IDENTIFIERS: (U) WUAFOSR2303B1, LPN-SRI-PYU-4917

AD-A161 994

PAGE 155 EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A161 992

7/2

AD-A161 992 CONTINUED

TEXAS UNIV AT AUSTIN DEPT OF CHEMISTRY

(U) Development of Practical MO Techniques for the  
Prediction of the Properties and Behavior of Materials.

DESCRIPTIVE NOTE: Final scientific rept. 1 Nov 82-30 Sep  
85.

OCT 85 23P

PERSONAL AUTHORS: Dewar, Michael J. S. ;

CONTRACT NO. F49820-83-C-0024

PROJECT NO. 2303

TASK NO. 82

MONITOR: AFOSR  
TR-85-1028

UNCLASSIFIED REPORT

ABSTRACT: (U) A third generation semiempirical SCF MO treatment (AM1) has been developed in which the weaknesses of MNDO, in particular failure to reproduce hydrogen bonds, have been overcome. MNDO has been parameterized for Zn, Hg, Ge, Sn, Pb, Br, and I and reparameterized for Si and S. A version of MNDO with d AOs has been parameterized for chromium. Our computer programs have been improved and collected into a single package (MOPAC) which allows calculations of a wide variety of molecular properties, and additional graphics packages developed. Extensive calculations for pericyclic reactions has led to a new general rule, that multibond processes are not normally synchronous. The Diels-Alder reactions in particular have been shown to involve unsymmetrical transition states. Studies of anionic nucleophilic substitution have shown that the barriers in solution can be due entirely to desolvation of the anion, a result of major theoretical significance. Deriving from (2), a new explanation of the rates and specificities of enzyme reactions. Refutation of FO Theory as an effective general treatment of chemical reactions. A new interpretation of sigma interactions in molecules (sigmaconjugation). Evidence that tunnelling can play a more general role in chemistry than previously thought.

AD-A161 992

AD-A161 992

UNCLASSIFIED

PAGE 156

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A181 987 10/2 20/12

AD-A181 987 CONTINUED

GA TECHNOLOGIES INC SAN DIEGO CA

(U) Variable Band Gap Materials for Thermophotovoltaic Generators.

DESCRIPTORS: (U) \*ENERGY GAPS, \*ENERGY CONVERSION, \*GALLIUM ARSENIDES, \*CELLS, ABSORPTION, CONCENTRATION(COMPOSITION), CURRENTS, EFFICIENCY, MASS, MODELS, OPTIMIZATION, RANGE(EXTREMES), TEMPERATURE, VALUE, VOLTAGE, WEIGHTING FUNCTIONS

DESCRIPTIVE NOTE: Final technical rept. 15 Aug 84-15 Aug 85.

IDENTIFIERS: (U) PE81102F, WJAFOSR2301A7

SEP 85 132P

PERSONAL AUTHORS: Woolf, Lawrence D.; Bass, John C.; Elsner, Norbert B.

REPORT NO. GA-A18140

CONTRACT NO. F49620-84-C-0105

PROJECT NO. 2301

TASK NO. A7

MONITOR: AFOSR  
TR-85-1069

UNCLASSIFIED REPORT

ABSTRACT: (U) Thermophotovoltaic (TPV) properties of InGaAs cells with band gaps of either 1.15 or 1.2 eV, GaAs cells, and Si cells were investigated. In particular, dark and illuminated current vs voltage characteristics were obtained for a number of these concentrator cells at cell temperatures ranging from 300 to 550 K and currents varying from 10 to the minus 8th power to 10 A. Based on these data, the temperature dependence of the TPV efficiency for each of these cells was inferred for a fixed value of the parasitic absorption of the below-band-gap energy photons. For a given weighted parasitic absorption of 5%, the InGaAs cells have a significantly higher TPV efficiency than the GaAs or Si cells. TPV efficiencies approaching 40% at 300 K and 28% at 500 K appear feasible for the InGaAs cells. Based on these data, it was calculated that the specific mass of a space-based nuclear-TPV energy conversion system would be 10 kg/KW if InGaAs cells with 5% weighted parasitic absorption were used. In addition, a theoretical model was developed for determining the optimum efficiency of single and multiple band gap cells in TPV energy conversion.

AD-A181 987

AD-A181 987

UNCLASSIFIED

PAGE 157

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A161 908 9/3

AD-A161 908 CONTINUED

SOUTHEASTERN CENTER FOR ELECTRICAL ENGINEERING EDUCATION  
INC ST CLOUD FL

TRAJECTORIES, AIRFOILS, READING

IDENTIFIERS: (U) WJAFOSR2301D5, PE81102F

(U) USAF/SCEEE (United States Air Force/Southeastern  
Center for Electrical Engineering Education) Research  
Initiation Program Research Reports. Volume 2.

DESCRIPTIVE NOTE: Interim rept..

MAR 85 987P

PERSONAL AUTHORS: Peele, Warren D. ;

CONTRACT NO. F49620-82-C-0035

PROJECT NO. 2301

TASK NO. D5

MONITOR: AFOSR  
TR-85-0905

UNCLASSIFIED REPORT

Availability: Document partially illegible.

SUPPLEMENTARY NOTE: See also Volume 1, AD-A161 907.

ABSTRACT: (U) Partial Contents: A Study in the  
Mechanical Characterization of Advanced Composite  
Laminates; Modeling of Multi-Echelon and Multi-Indenture  
Items with Limited Repair and Transportation During War  
Time Emergencies; The Effect of Moderate to High Pitching  
Rates on the Aerodynamic Performance of a NACA 0015  
Airfoil at a Reynolds No. of 100,000; Kinetic Energy  
Dependence of Ion Polar Dr. Timothy Su Molecule Collision  
Rate Constants by Trajectory Calculations; A Dynamic  
Resource Allocation Model; Electron Paramagnetic  
Resonance Study of Defects in III-V Semiconductor; Effect  
of the Graph on Comprehension and Long-Term Recalls of  
the Text: Eye Movements in Reading.

DESCRIPTORS: (U) \*ELECTRICAL ENGINEERING, COMPOSITE  
MATERIALS, LAMINATES, ALLOCATIONS, DYNAMICS, MODELS,  
RESOURCE MANAGEMENT, ELECTRON PARAMAGNETIC RESONANCE,  
COMPREHENSION, GRAPHS, COLLISIONS, CONSTANTS, AERODYNAMIC  
CHARACTERISTICS, EDUCATION, EYE MOVEMENTS, HIGH RATE,  
PITCH(MOTION), KINETIC ENERGY, MODELS, COMPUTATIONS,

AD-A161 908

AD-A161 908

UNCLASSIFIED

PAGE 158

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A161 907 9/3

AD-A161 907 CONTINUED

SOUTHEASTERN CENTER FOR ELECTRICAL ENGINEERING EDUCATION  
INC ST CLOUD FL

(U) USAF/SCEE (United States Air Force/Southeastern  
Center for Electrical Engineering Education) Research  
Initiation Program Research Reports. Volume 1.

DESCRIPTIVE NOTE: Interim rept..

MAR 85 1125P

PERSONAL AUTHORS: Peele, Warren D. ;

CONTRACT NO. F49820-82-C-0035

PROJECT NO. 2301

TASK NO. 05

MONITOR: AFOSR  
TR-85-0904

UNCLASSIFIED REPORT

Availability: Document partially illegible.

SUPPLEMENTARY NOTE: See also Volume 2, AD-A161 908.

ABSTRACT: (U) Partial contents: A Statistic For  
Measuring The Balance Of A Sample; Numerical And  
Analytical Study Of High Resolution Limb Spectral  
Radiance From Non-Equilibrium Atmospheres; Electron Waves  
In The Electrical Breakdown Of Gases; With Application To  
The Dart Leader In Lightning; Investigation Of Liquid  
Sloshing In Spin-Stabilized Satellites; Surface Potential  
As A Laser Damage Diagnostic; A Study Of Slot Waveguides  
For Electrostatically Variable SAW Delay Lines;  
Combustion Modeling Of Homogeneous Solid Propellants With  
Selectively Absorbing Inert Particle Additives; Interim  
Report Development And Testing Of An Animal Model Of  
State Dependent Effects With Atropine; Combined Blast  
And Fragment Loading Of Reinforced Concrete; Infrared  
Spectroscopy Of Extrinsic P-Type Silicon; Interfacing Or  
Models And Information Systems: A Systematic approach;  
The Proton In Multisolvant Clusters. 1. The Acetonitrile-  
Water System; Training To Improve The Accuracy And  
Validity Of Performance Ratings; Laser Damage In  
Crystalline Silicon Observed under RHEED; Analysis of

AD-A161 907

AD-A161 907

UNCLASSIFIED

PAGE 159

EVK551

Swirling Nozzle Flow by a Time-Dependent finite  
Difference Technique; Analysis of Condensation Phenomena  
for Conventional Heat Pipes; Avionics Reliability  
Analysis; Communications network Simulation topics With a  
Computer network Simulation Model; Development and  
Evaluation of Scales for the Organizational Assessment  
Package with Work Groups as the Unit of Analysis..

DESCRIPTORS: (U) \*ELECTRICAL ENGINEERING, LIGHTNING,  
BREAKDOWN(ELECTRONIC THRESHOLD), ACOUSTIC DELAY LINES,  
SURFACE ACOUSTIC WAVE DEVICES, SLOSHING, SPACECRAFT  
COMPONENTS, SPIN STABILIZATION, EMISSION SPECTRA, COSMIC  
RAYS, STATISTICAL SAMPLES, BALANCE, WAVEGUIDE SLOTS,  
SOLID PROPELLANTS, COMBUSTION STABILITY, ATROPINE, DRUG  
ADDITION, BLAST LOADS, REINFORCED CONCRETE, SILICON, P  
TYPE SEMICONDUCTORS, INFRARED SPECTROSCOPY, SOLVENTS,  
WATER, ACETONITRILE, CONDENSATION, HEAT PIPES, NOZZLE GAS  
FLOW

IDENTIFIERS: (U) PEG1102F, WUAFDSR2301D5

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A161 847

9/4

PITTSBURGH UNIV PA CENTER FOR MULTIVARIATE ANALYSIS

(U) On Detection of Number of Signals in Presence of Colored Noise Using Information Theoretic Criteria.

DESCRIPTIVE NOTE: Technical rept..

OC7 85

36P

PERSONAL AUTHORS: Zhao, L. C.; Krishniah, P. R.; Bai, Z. D.

REPORT NO. TR-85-39

CONTRACT NO. N00014-85-K-0292, F49620-85-C-0008

MONITOR: AFOSR  
TR-85-1131

UNCLASSIFIED REPORT

ABSTRACT: (U) In this paper, the authors proposed information theoretic criteria for detection of the number of signals when the noise is colored. The strong consistency of these criteria is also established. Keywords include: Colored noise; Information theoretic criteria; Likelihood ratio tests; Signal detection; and Strong consistency.

DESCRIPTORS: (U) \*DETECTION, \*INFORMATION THEORY, \*NOISE, \*SIGNALS, CONSISTENCY

AD-A161 713

9/3

YALE UNIV NEW HAVEN CT DEPT OF ELECTRICAL ENGINEERING

(U) New Directions in Parameter Adaptive Control,

84

4P

PERSONAL AUTHORS: Morse, A. S.;

CONTRACT NO.: AFOSR-84-0242, NSF-ECS84-13322

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-85-0981

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Proceedings IEEE Conference on Decision and Control, 1984.

ABSTRACT: (U) In a recent paper Nussbaum made a useful contribution to adaptive control theory by showing that there are smooth algorithms, not incorporating probing signals, which are capable of adaptively stabilizing any one-dimensional linear system  $y = ay + gu$  with a and g unknown and g is not equal to 0. The purpose of this reprint is to discuss some of the new directions in adaptive control theory implied by this work. (Author)

DESCRIPTORS: (U) \*CONTROL THEORY, \*ADAPTIVE CONTROL SYSTEMS, ALGORITHMS, LINEAR SYSTEMS, ONE DIMENSIONAL, PARAMETERS, STABILIZATION SYSTEMS, REPRINTS

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A1

AD-A161 847

AD-A161 713

UNCLASSIFIED

PAGE 180

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A161 660 7/4 7/5

AD-A161 659 7/5 7/4

COLUMBIA UNIV NEW YORK DEPT OF CHEMISTRY

CORNELL UNIV ITHACA NY DEPT OF CHEMISTRY

(U) The Observation of CIDEP (Chemically Induced Dynamic Electron Polarization) from the Photodecomposition of Dibenzyl Ketone in Micellar Solution.

(U) Photodissociation Dynamics of Nozzle-Cooled ICN,

MAR 85 8P

84

10P

PERSONAL AUTHORS: Turro, N. J. ; Paczkowski, M. A. ; Zimmt, M. B. ; Wan, J. K. S. ;  
P. L. ; Marinelli, W. J. ; Sivakumar, N. ; Houston,

CONTRACT NO. AFOSR-81-0013

CONTRACT NO. F49620-83-K-0012, NSF-CHE83-14146

PROJECT NO. 2303

PROJECT NO. 2303

TASK NO. B2

TASK NO. B1

MONITOR: AFOSR

MONITOR: AFOSR

TR-85-0886

TR-85-0907

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Chemical Physics Letters, v114 n5, 6, 15 Mar 85.

SUPPLEMENTARY NOTE: Pub. in the Jnl. of Physical Chemistry, v88 n26 p6685-6692 1984.

ABSTRACT: (U) Our interest in the spin and molecular dynamics of radicals and radical pairs in heterogeneous solution has prompted us to employ time-resolved ESR as a means of gaining further kinetic and mechanistic information. The photolysis of dibenzyl ketone (DBK) in sodium dodecyl sulfate micellar solution was studied using time-resolved ESR techniques. The Chemically Induced Dynamic Electron Polarization (CIDEP) spectra observed are consistent with phenacyl-benzyl radical pair interactions with little, if any contribution from benzyl-benzyl radical pair interactions. There is a marked contrast in the CIDEP observed in homogeneous and micellar solution which cannot be explained simply by viscosity arguments.

DESCRIPTORS: (U) \*KETONES, \*BENZYL RADICALS, \*PHOTOLYSIS, \*POLARIZATION, \*MOLECULAR PROPERTIES, ELECTRON SPIN RESONANCE, MOLECULE MOLECULE INTERACTIONS, HETEROGENEITY, SOLUTIONS(GENERAL), CHEMICAL RADICALS, COLLOIDS, SOLUTIONS(GENERAL), SULFATES, HOMOGENEITY, DYNAMICS, SODIUM, REPRINTS

IDENTIFIERS: (U) PE81102F, WUAFOSR230382

AD-A161 660

AD-A161 659

UNCLASSIFIED

PAGE 161

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A161 650 CONTINUED

AD-A161 650 12/1 9/2

CITY COLL NEW YORK DEPT OF ELECTRICAL ENGINEERING

(U) Optical Acquisition, Image and Data Compression.

DESCRIPTIVE NOTE: Final technical rept. 1 Mar 83-31 May 85.

JUL 85 89P

PERSONAL AUTHORS: Eichmann, George ;

CONTRACT NO. AFOSR-83-0081

PROJECT NO. 2305

TASK NO. B1

MONITOR: AFOSR  
TR-85-0971

UNCLASSIFIED REPORT

ABSTRACT: (U) The Hough transform (HT) is an efficient shape detector that maps straight lines into a two-parameter feature space. Recently it has been pointed out that the forward Radon transform (FRT), well known from the theory of computed tomography, and the HT are equivalent for binary images. In this paper, analog coherent optical implementation of the FRT is discussed. The FRT will not only be of use in implementing the HT shape descriptors but also act as a coherent optical preprocessor for the implementation of multidimensional convolution, correlation, and spectral analysis using 1-D acoustooptical signal processing devices. Several different coherent optical FRT architectures are presented. Experimental results using conventional coherent Fourier transform configuration are given. The relationship between the coherent optical implementation of the FRT and the inverse Radon transform, an important tool in computed tomography, is also detailed. Keywords include: optical information processing, superresolution, spectral estimation, phase reconstruction, and amplitude reconstruction.

DESCRIPTORS: (U) \*OPTICAL PROCESSING, \*SHAPE, \*TRANSFORMATIONS(MATHEMATICS), \*IMAGE PROCESSING, ARCHITECTURE, COHERENCE, OPTICAL PROPERTIES, PREPROCESSING, DATA COMPRESSION, CONVOLUTION, OPTICAL

AD-A161 650

AD-A161 650

UNCLASSIFIED

PAGE 182

EVK551

DATA, DETECTORS, ESTIMATES, SPECTRA, IMAGES, TOMOGRAPHY, ACQUISITION, SPECTRUM ANALYSIS, THEORY, SIGNAL PROCESSING, ACOUSTOOPTICS, AMPLITUDE, PHASE, ANALOG SYSTEMS, CORRELATION, FOURIER TRANSFORMATION, RESOLUTION, ALGORITHMS, MATHEMATICAL FILTERS

IDENTIFIERS: (U) \*Hough transforms, Image reconstruction, FRT(Forward Radon Transforms), Shape detectors, Superresolution, WUAFOSR230581, PE81102F



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A161 589 9/4 12/1

AD-A161 589 CONTINUED

CONNECTICUT UNIV STORRS DEPT OF ELECTRICAL ENGINEERING

(U) Dual Control and Prevention of the Turn-off Phenomenon  
in a Class of MIMO Systems.

85 7P

PERSONAL AUTHORS: Mookerjee, P. ; Bar-Shalom, Y. ; Molusis, J.  
A. ;

CONTRACT NO. AFOSR-84-0112

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-85-0944

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Proceedings of IEEE  
Conference on Decision and Control (24th) Fort Lauderdale,  
FL 11-13 Dec 85.

ABSTRACT: (U) A recently developed methodology of  
adaptive dual control based upon sensitivity functions is  
applied here to a multi-variable input-output model. The  
plant has constant but unknown parameters. It represents  
a simplified linear version of the relationship between  
the vibration output and the higher harmonic control  
input for a helicopter. The cautious and the new dual  
controller are examined. In many instances, the cautious  
controller is seen to turn off. The new dual controller  
modifies the cautious control design by numerator and  
denominator correction terms which depend upon the  
sensitivity functions of the expected future cost and  
avoids the turn-off and burst phenomena. Monte-Carlo  
simulations and statistical tests of significance  
indicate the superiority of the dual controller over the  
cautious and the heuristic certainty equivalence  
controllers. Keywords: Reprints; Adaptive dual control;  
Monte-Carlo simulations.

DESCRIPTORS: (U) \*ADAPTIVE CONTROL SYSTEMS, CONTROL,  
FUNCTIONS, HARMONICS, HELICOPTERS, INPUT, INPUT OUTPUT  
MODELS, MONTE CARLO METHOD, MULTIVARIATE ANALYSIS, OUTPUT,  
PREVENTION, REPRINTS, SENSITIVITY, SIMULATION.

AD-A161 589

AD-A161 589

UNCLASSIFIED

PAGE 183

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A161 514 12/1

AD-A161 509 9/2

NORTH CAROLINA UNIV AT CHAPEL HILL DEPT OF STATISTICS

MASSACHUSETTS UNIV AMHERST DEPT OF ELECTRICAL AND  
COMPUTER ENGINEERING

(U) On Stochastic Integration by Series of Wiener  
Integrals.

(U) The De Bruijn Multiprocessor Network: A Versatile  
Sorting Network,

DESCRIPTIVE NOTE: Technical rept. Sep 84-Aug 85.

AUG 85 33P

JUN 85 10P

PERSONAL AUTHORS: Rosinski, Jan ;

PERSONAL AUTHORS: Samatham, M. R. ; Pradhan, D. K. ;

REPORT NO. TR-112

CONTRACT NO. AFOSR-84-0052

CONTRACT NO. F49620-82-C-0009

PROJECT NO. 2304

TASK NO. 2304

TASK NO. A2

TASK NO. A5

MONITOR: AFOSR  
TR-85-0943

MONITOR: AFOSR

UNCLASSIFIED REPORT

TR-85-0947

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in IEEE Proceedings of the  
Annual International Symposium on Computer Architecture  
(12th), p360-367, 17-19 Jun 85.

ABSTRACT: (U) Stochastic integrals of random functions  
with respect to a white noise random measure are defined  
in terms of random series of usual Wiener integrals.  
Conditions for the existence of such integrals are  
obtained in terms of the nuclearity of certain operators  
on L2-spaces. The relation with the Fisk-Stratonovich  
symmetric integral is also discussed. (Author)

DESCRIPTORS: (U) \*INTEGRALS, \*NUMERICAL INTEGRATION,  
NOISE, STOCHASTIC PROCESSES, FUNCTIONS(MATHEMATICS),  
SERIES(MATHEMATICS)

IDENTIFIERS: (U) Wiener Integrals, PE81102F,  
WUAFOSR2304A5

AD-A161 514

AD-A161 508

UNCLASSIFIED

PAGE 184

EVK551

ABSTRACT: (U) Recent work has classified sorting  
architectures as: (A) Sequential input/Sequential output,  
(B) Parallel input/Sequential output, (D) Sequential  
input/Parallel output, (E) Hybrid input/Hybrid output.  
The classification is based, not only on the I/O method,  
but also on the interconnection network, the sorting  
algorithm and the type of keys used. This reprint  
demonstrates that the architectures based on the  
undirected de Bruijn graphs can sort data items in all of  
the above mentioned categories. To the best of our  
knowledge, no other single network which can sort data  
items in all the categories is known. Sorting algorithms  
and time complexities that correspond to each of these  
categories are given here. It is shown that these  
architectures can achieve the previously known best upper  
bound times, in all of the categories. Also, it is proven  
that they work as sorting networks, even in the presence  
of some faults. (Author)

DESCRIPTORS: (U) \*SORTING, \*MULTIPROCESSORS, \*COMPUTER  
ARCHITECTURE, HYBRID SYSTEMS, NETWORKS, INPUT, SEQUENCES,  
SORTING, GRAPHS, NETWORK FLOWS, INPUT OUTPUT PROCESSING,  
ALGORITHMS, PARALLEL PROCESSING, REPRINTS

UNCLASSIFIED

OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A161 509 CONTINUED

AD-A161 497 8/11 18/3

IDENTIFIERS: (U) PEB1102F, WUAFOSR2304A2

CALIFORNIA UNIV BERKELEY SEISMOGRAPHIC STATION

(U) Regional Studies with Broadband Data.

DESCRIPTIVE NOTE: Final rept. 1 Oct 83-31 Dec 84,

FEB 85 72P

PERSONAL AUTHORS: MCEVILLY, T. V. ; JOHNSON, L. R. ;

CONTRACT NO. F49620-83-C-0020, ARPA Order-4397

MONITOR: AFOSR  
TR-85-0889

UNCLASSIFIED REPORT

ABSTRACT: (U) The general objective of this research supported by this grant has been a better definition of the explosion and earthquake source processes. Love and Rayleigh wave group velocities for the Tibetan Plateau have been used to infer crustal velocities for that region. Results include a crustal thickness of 74 km, a prominent low velocity zone for shear waves in the depth range 24-34 km, and a uniformly high shear wave velocity of 3.88 km/sec in the lower 40 km of the crust. The low velocity zone can best be interpreted in terms of a zone of elevated pore pressure, while the high velocity in the lower crust and upper mantle imply the presence of usually low temperatures in the depth range of 50-100 km. Such results are consistent with the hypothesis of large-scale underthrusting of the Indian continent. In recent years the research has moved toward the detailed study of source mechanisms of earthquakes and explosions with broadband data. Keywords: Nuclear explosion; Seismic data; Surface waves; Source mechanisms.

DESCRIPTORS: (U) \*NUCLEAR EXPLOSIONS, \*RAYLEIGH WAVES, \*SHEAR PROPERTIES, \*SEISMIC DATA, \*SURFACE WAVES, BROADBAND, DEPTH, EARTH CRUST, EARTH MANTLE, EARTHQUAKES, HIGH PRESSURE, HIGH VELOCITY, HYPOTHESES, LOW TEMPERATURE, LOW VELOCITY, PORE PRESSURE, REGIONS, SECONDARY WAVES, SOURCES, THICKNESS, VELOCITY, WAVES

AD-A161 509

AD-A161 497

UNCLASSIFIED

PAGE 165

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A161 437 12/1

AD-A161 421 5/2

NORTH CAROLINA UNIV AT CHAPEL HILL DEPT OF STATISTICS

CALIFORNIA UNIV BERKELEY ELECTRONICS RESEARCH LAB

(U) Innovations and Wold Decompositions of Stable Sequences.

(U) Request for Instrumentation.

DESCRIPTIVE NOTE: Technical rept..

DESCRIPTIVE NOTE: Final scientific rept. 1 Sep 83-31 Aug 84,

JUL 85 41P

AUG 84 12P

PERSONAL AUTHORS: Cambanis,Stamatis ;Hardin,Clyde D. , Jr. ;Weron,Aleksander ;

PERSONAL AUTHORS: Stonebraker,M. ;

REPORT NO. TR-106

CONTRACT NO. AFOSR-83-0349

CONTRACT NO. F49620-82-C-0009

PROJECT NO. 2917

TASK NO. 2304

TASK NO. A5

TASK NO. A5

MONITOR: AFOSR

TR-85-0972

MONITOR: AFOSR  
TR-85-0948

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) For symmetric stable sequences, notions of innovation and Wold decomposition (WD) are introduced, characterized, and their ramifications in prediction theory are discussed. As the usual covariance orthogonality is inapplicable, the non-symmetric James orthogonality is used, thus leading to right and left innovations and Wold decompositions, which are related to regression prediction and least p sub th moment prediction, respectively. Independent innovations and WD are also characterized, and several examples illustrating the various decompositions are presented. Keywords: Stochastic processes; Random variables; Symmetry; Linearity. (Author)

DESCRIPTORS: (U) \*STABILITY, \*SEQUENCES(MATHEMATICS), COVARIANCE, DECOMPOSITION, MOMENTS, ORTHOGONALITY, RANDOM VARIABLES, STOCHASTIC PROCESSES, SYMMETRY, THEORY, LINEARITY, REGRESSION ANALYSIS, MATHEMATICAL PREDICTION

IDENTIFIERS: (U) Wold decomposition, Nonsymmetric James orthogonality, PE81102F, WJAFOSR2304A5

AD-A161 437

AD-A161 421

UNCLASSIFIED

PAGE 168

EVK551

ABSTRACT: (U) The authors proposed a research program to develop a generalized database manager to support diverse kinds of data including text, icons, forms, maps and other spatial data. The proposed research also included investigating support for integrated data browsers to allow end-users to query, step through, and update diverse data. Specific topics to be investigated included query language facilities to support text and geometric data, user-defined abstract data types in a DBMS, an ordered relation access method for text and other ordered data, extended secondary indexes, main memory databases, concurrency control for data browsers, and an application program interface based on windows. (Author)

DESCRIPTORS: (U) \*DATA BASES, \*DATA MANAGEMENT, INTERFACES, INDEXES, SECONDARY, INTEGRATED SYSTEMS, FACILITIES, INTERROGATION, GEOMETRY, MEMORY DEVICES, PROGRAMMING LANGUAGES

IDENTIFIERS: (U) PE81102F, WJAFOSR2817A5

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

AD-A161 413 12/1

NORTH CAROLINA UNIV AT CHAPEL HILL CENTER FOR STOCHASTIC PROCESSES

(U) Random Integral Representations for Classes of Limit Distributions Similar to Levy Class L(O).

DESCRIPTIVE NOTE: Technical rept..

SEP 85 32P

PERSONAL AUTHORS: Jurek, Zbigniew J. ;

REPORT NO. TR-117

CONTRACT NO. F49620-82-C-0009

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-85-0958

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Prepared in cooperation with Auburn Univ., AL. Dept. of Mathematics.

ABSTRACT: (U) For a linear operator  $Q$ , on a Banach space  $E$ , and a real number  $\beta$ , there are introduced classes,  $\mu$  sub  $\beta$  (0), of some limit distributions such that  $\mu$  sub  $Q(I)$  coincides with the Levy class  $L_0$ . Elements from  $\mu$  sub  $\beta$  (Q) are characterized in terms of convolution equations and as probability distributions of some random integral functionals. The continuity and fix points of this random mapping is studied. It is shown that fix points coincide with the class of  $Q$ -stable measures.  
Keywords: Levy class  $L_0$ . Infinitely divisible measures; Random integrals; Skorohod topology.

DESCRIPTORS: (U) \*PROBABILITY DISTRIBUTION FUNCTIONS, BANACH SPACE, CONVOLUTION, EQUATIONS, INTEGRALS, LINEARITY, MAPPING, OPERATORS(MATHEMATICS), TOPOLOGY

IDENTIFIERS: (U) WUAFOSR2304A5, PE81102F

AD-A161 413

UNCLASSIFIED

SEARCH CONTROL NO. EVK551

AD-A161 412 12/1

NORTH CAROLINA UNIV AT CHAPEL HILL CENTER FOR STOCHASTIC PROCESSES

(U) On Prediction of Harmonizable Stable Processes.

DESCRIPTIVE NOTE: Technical rept. Sep 84-Aug 85,

JUL 85 46P

PERSONAL AUTHORS: Cambanis, S. ; Mianee, A. G. ;

REPORT NO. TR-110

CONTRACT NO. F49620-82-C-0009

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-85-0950

UNCLASSIFIED REPORT

ABSTRACT: (U) Spectral and time domain criteria for a harmonizable stable process to be regular are given, which provide an orthogonal moving average representation. Also criteria for such processes to have linear predictor filters are obtained; these include the positivity of the distance and of the angle between past and future. In the process, the notion of angle between isotropic complex stable random variables is introduced and studied.  
Keywords: Harmonizable stable processes; Moving average representation; Linear predictors; Angle; Isotropic complex random variables.

DESCRIPTORS: (U) \*MATHEMATICAL PREDICTION, COMPLEX VARIABLES, ISOTROPISM, LINEAR FILTERING, RANDOM VARIABLES, STABILITY, TIME DOMAIN

IDENTIFIERS: (U) Moving average representation, WUAFOSR2304A5, PE81102F

AD-A161 412

PAGE 187 EVK551

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A161 406 12/1

AD-A161 385 4/1 8/11 20/3

MISSOURI UNIV-ROLLA

MCMILLAN SCIENCE ASSOCIATES INC LOS ANGELES CALIF

(U) Goodness-of-Fit Tests for the Weibull Distribution  
with Unknown Parameters and Heavy Censoring.

85 14P

PERSONAL AUTHORS: Aho, Michael ; Bain, Lee J. ; Engelhardt,  
Max ;

CONTRACT NO. AFOSR-84-0164

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-85-0945

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Statistical Computer  
Simulation, v21 p213-225 1985.

ABSTRACT: (U) Goodness-of-fit tests are considered for testing the two-parameters Weibull distribution based on type II censored sampling with both parameters assumed unknown. Some extremely heavy censoring levels are considered which are useful when analyzing in-service field data with a large population and a small number of failures. Critical values are obtained by Monte Carlo simulation for Kolmogorov-Smirnov, Kuiper and Cramer-von Mises type test statistics. The approximate Snedecor's F-distribution is verified for the Mann-Scheuer-Fertig test statistic. The two-sided Mann-Scheuer-Fertig test is also studied and found to be important. A power study is carried out for these four test statistics for both moderate and heavy censoring for a number of different alternative models. (Reprint)

DESCRIPTORS: (U) \*STATISTICAL DISTRIBUTIONS,  
\*STATISTICAL TESTS, \*FITTING FUNCTIONS(MATHEMATICS),  
MONTE CARLO METHOD, POPULATION, SAMPLING, SIMULATION,  
VALUE, WEIBULL DENSITY FUNCTIONS, POPULATION(MATHEMATICS),  
CENSORSHIP, REPRINTS, PARAMETERS

IDENTIFIERS: (U) \*Goodness of fit tests, WUAFOSR2304A5,  
PE61102F

AD-A161 406

AD-A161 385

## UNCLASSIFIED

PAGE 168

EVK551

## UNCLASSIFIED REPORT

ABSTRACT: (U) This paper focuses on manifestations of earthquake light that appear to be of electromagnetic origin: general atmospheric luminosity; light flashes; and auroral effects. Explanations of near-ground phenomena are offered in terms of acceleration of free electrons in air by a geoelectric field, both electron number density and field possibly being enhanced by the earthquake. High-altitude phenomena resemble natural aurorae, but apparently utilize electrons stored in the natural reservoirs of the ionosphere (F layer) and Van Allen belt. Various mechanisms for accelerating ionospheric electrons and for lowering the mirror-point altitudes of Van Allen electrons are examined. (Author)

DESCRIPTORS: (U) \*ATMOSPHERIC ELECTRICITY, \*EARTHQUAKES,  
\*LIGHT, ELECTROMAGNETIC PROPERTIES, FREE ELECTRONS,  
ACCELERATION, ELECTRON DENSITY, F REGION, VAN ALLEN  
RADIATION BELT, TELLURIC CURRENTS, RADON, IONOSPHERE,  
PIEZOELECTRICITY, TRAPPING(CHARGED PARTICLES), FLASHES,  
EARTH ATMOSPHERE, LUMINOSITY, LIGHTNING, AIRGLOW,  
ELECTRIC FIELDS, AURORAE, MAGNETIC FIELDS, GEOMAGNETISM,  
HIGH ALTITUDE, LOW ALTITUDE

IDENTIFIERS: (U) \*Earthquake light, Geoelectric fields,  
Electron reservoirs, Mirror point altitudes

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A161 377

12/1

NORTH CAROLINA UNIV AT CHAPEL HILL DEPT OF STATISTICS

(U) A Note on Levene's Tests for Equality of Variances.

JUL 85

5P

PERSONAL AUTHORS: Carroll, Raymond J.; Schneider, Helmut;

REPORT NO. MMS-1553

CONTRACT NO. F49620-82-C-0009

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-85-0965

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Statistics & Probability Letters, v3 p191-194 Jul 85.

ABSTRACT: (U) Consider testing for equality of variances in a one-way analysis of variance. Levene's test is the usual F-test for equality of means computed on pseudo-observations, which one defines as the absolute deviations of the data points from an estimate of the group 'center'. We show that, asymptotically, Levene's test has the correct level whenever the estimate of group 'center' is an estimate of group median. This explains why published Monte-Carlo studies have found that Levene's original proposal of centering at the sample mean has the correct level only for symmetric distributions, while centering at the sample median has correct level even for asymmetric distributions. Generalizations are discussed. (Author)

DESCRIPTORS: (U) \*ANALYSIS OF VARIANCE, ASYMMETRY, DATA BASES, DISTRIBUTION, MONTE CARLO METHOD, SYMMETRY, STATISTICAL TESTS, MEAN, REPRINTS

IDENTIFIERS: (U) \*Levenes test, WUAFOSR2304A5, PE81102F

AD-A161 377

UNCLASSIFIED

PAGE 189

EVK551

AD-A161 368

12/1

DUKE UNIV DURHAM NC DEPT OF COMPUTER SCIENCE

(U) Finding Critical Sets.

DESCRIPTIVE NOTE: Technical paper.

SEP 85

16P

PERSONAL AUTHORS: Loveland, Donald W.;

REPORT NO. CS-1985-22

CONTRACT NO. AFOSR-83-0205, AFOSR-81-0221

PROJECT NO. 2304

TASK NO. A7

MONITOR: AFOSR  
TR-85-0951

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Revision of Rept. no. CS-1982-23.

ABSTRACT: (U) Several algorithms are given for finding a critical subset S determined by a binary monotonic set function over a given set U. A set S is critical if  $f(T) = 1$  for all T such that S is a subset of T and  $f(R) = 0$  for all R such that R is a perfect subset of S. Upper bounds on the worst case times for the algorithms, determined by the number of calls to the binary set function, vary downwards from  $2^{r(\log(\text{base } 2) n)}$  function calls. Here n is the size of U and r is the size of the critical set found. We find that the conceptually easiest algorithm is not the easiest to program and also that the algorithms with better upper bounds fare more poorly in practice, based on a small sample of random trails. Although finding one critical set is easy we also show that it can quickly get very difficult to find additional critical sets, simply because it can be hard to separate known critical sets from further possible critical sets. (Author)

DESCRIPTORS: (U) \*SET THEORY, ALGORITHMS, MONOTONE FUNCTIONS, CRITICALITY(GENERAL)

IDENTIFIERS: (U) Upper bounds, WUAFOSR2304A7, PE81102F

AD-A161 368

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A161 359 12/1

AD-A161 356 9/2

NORTH CAROLINA UNIV AT CHAPEL HILL CENTER FOR STOCHASTIC PROCESSES

MASSACHUSETTS UNIV AMHERST DEPT OF ELECTRICAL AND COMPUTER ENGINEERING

(U) Some General Probabilistic Estimations for the Rate of Convergence in Operator Semigroup Representations.

(U) Dynamically Restructurable Fault-Tolerant Processor Network Architectures.

DESCRIPTIVE NOTE: Technical rept..

MAY 85 15P

SEP 85 10P

PERSONAL AUTHORS: Pradhan, Dhiraj K. ;

PERSONAL AUTHORS: Pfeifer, Dietmar ;

CONTRACT NO. AFOSR-84-0052

REPORT NO. TR-114

PROJECT NO. 2304

CONTRACT NO. F49620-82-C-0009

TASK NO. A2

PROJECT NO. 2304

MONITOR: AFOSR TR-85-0934

TASK NO. A5

UNCLASSIFIED REPORT

MONITOR: AFOSR TR-85-0967

SUPPLEMENTARY NOTE: Pub. in IEEE Transactions on Computers, VC-34 n5 p434-447 May 85.

UNCLASSIFIED REPORT

ABSTRACT: (U) Starting from well-known estimations for the rate of convergence in Hille's, Phillips' and Widder's representation formulas for operator semigroups this document shows that by a suitable probabilistic approach, these results are easily reobtained, and can immediately be generalized to arbitrary (probabilistic) representation formulas. Some examples are also considered. Keywords: Random variables; Linear operators; Approximation(Mathematics); Stochastic processes. (Author)

ABSTRACT: (U) A class of novel fault-tolerant multiprocessor networks is proposed. These networks are restructurable in that they can assume different logical configurations to suit different problem environments. More importantly, this restructuring capability is not altered even after the occurrence of faults. These networks are novel in that they uniquely combine certain desirable features, including self-routing of messages, dynamic reconfigurability, fault-tolerance, the ability to incorporate incremental extension, as well as the capacity to be partitioned with fault-tolerance. What is important about these fault-tolerant features is that they are built-in as an integral part of the design, and not as done traditionally, by means of redundancy. Also, the networks are robust with respect to all single component failures in that the network properties remain relatively intact in spite of the occurrence of a fault. Consequently, the network is not only free from single point failures, but can provide for graceful degradation - an important consideration in any fault-tolerant design. Keywords: Binary tree; circuit switching; distributed system; dynamic processing; emulation; fault-tolerant interconnection; linear array; modular network; packet switching; parallel system; processor array; self-routing.

DESCRIPTORS: (U) \*ESTIMATES, \*OPERATORS(MATHEMATICS), APPROACH, CONVERGENCE, LINEARITY, PROBABILITY, RANDOM VARIABLES, RATES, STOCHASTIC PROCESSES, FORMULAS(MATHEMATICS), APPROXIMATION(MATHEMATICS)

IDENTIFIERS: (U) \*Semigroups(Mathematics), WUAFOSR2304A5. PE81102F

AD-A161 359

AD-A161 356

UNCLASSIFIED

PAGE 170

EVK551



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A161 358 CONTINUED

AD-A161 355 13/13 22/2

DESCRIPTORS: (U) \*MULTIPROCESSORS, \*COMPUTER ARCHITECTURE, \*FAULT TOLERANT COMPUTING, ARRAYS, CIRCUITS, DEGRADATION, DYNAMICS, LINEAR ARRAYS, PACKETS, PARTS, PROCESSING, PROCESSING EQUIPMENT, REDUNDANCY, SWITCHING, SWITCHING CIRCUITS, TREES, NETWORKS, REPRINTS, MODULES(ELECTRONICS)

HARRIS CORP MELBOURNE FL GOVERNMENT AEROSPACE SYSTEMS DIV

(U) Exploration of the Maximum Entropy/Optimal Projection Approach to Control Design Synthesis for Large Space Structures.

IDENTIFIERS: (U) WUAFOSR2304A2, PE81102F

DESCRIPTIVE NOTE: Annual rept. no. 1, 2 Jan 84-28 Feb 85,

FEB 85 243P

PERSONAL AUTHORS: Hyland, David C.; Bernstein, Dennis S.;

CONTRACT NO. F49620-84-C-0015

PROJECT NO. 2307

TASK NO. B1

MONITOR: AFOSR  
TR-85-0988

UNCLASSIFIED REPORT

ABSTRACT: (U) Increased interest in deploying large flexible spacecraft has focused attention on active structural control techniques to achieve crucial advances in vibration suppression, pointing accuracy and shape control. The extreme complexity of such systems, and the lack of accurate finite-element structural models present severe control-design challenges which were extensively documented by previous Government research Programs. Optimal Projection/Maximum Entropy Stochastic Modelling and Reduced-Order Design Synthesis is a rigorous new approach to this class of problems. Inspired by Statistical Energy Analysis, a branch of dynamic modal analysis developed for analyzing acoustic vibration problems, its present stage of development embodies a fundamental generalization of classical steady-state Kalman filter and linear-quadratic-Gaussian optimal control theory. Keywords: Stochastic processes; Parameter uncertainty; Maximum entropy formalism; Quadratic Optimization; Reduced-order dynamic compensation.

DESCRIPTORS: (U) \*FLEXIBLE STRUCTURES, \*SPACE SYSTEMS, \*CONTROL SYSTEMS, ACOUSTIC WAVES, VIBRATION, CONTROL, SYNTHESIS, OPTIMIZATION, QUADRATIC EQUATIONS, COMPENSATION, DYNAMICS, REDUCTION, KALMAN FILTERING.

AD-A161 358

AD-A161 355

UNCLASSIFIED

PAGE 171 EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A161 355 CONTINUED

STEADY STATE, FINITE ELEMENT ANALYSIS, ACCURACY, AIMING,  
CONTROL, SHAPE, STATISTICAL ANALYSIS, STRUCTURES,  
STOCHASTIC PROCESSES, SUPPRESSION, ENTROPY

AD-A161 349 9/2

INTEGRATED SYSTEMS INC PALO ALTO CA

(U) Robust Adaptive Control.

IDENTIFIERS: (U) \*Large Space structures, WUAFOSR230781,  
PE61102F

DESCRIPTIVE NOTE: Final rept. 15 Sep 84-15 Feb 85,

SEP 85 59P

PERSONAL AUTHORS: Kosut, Robert L. ;

REPORT NO. ISI-81

CONTRACT NO. F49620-84-C-0085

PROJECT NO. 3005

TASK NO. A1

MONITOR: AFOSR  
TR-85-0968

UNCLASSIFIED REPORT

Availability: Document partially illegible.

ABSTRACT: (U) This project addresses the problems involved in developing an interactive software system that integrates adaptive and nonlinear control design procedures with a real-time processor for implementation. The proposed system implements complex control laws in the laboratory for rapid testing evaluation and tuning. Recent hardware development and software methodologies form the basis of computer-aided control system design (CACSD) products. The two basic elements defined in the study are: (1) A user friendly CACSD software package for product development and validation of control laws using simulation models, (2) A real-time hardware system which can automatically implement control laws designed by the CACSD software package, without real-time programming. The products proposed under this project will significantly reduce engineering development time. Many new applications will occur as more and more improved CAE tools are available and the designed control laws can be rapidly verified in the laboratory. The hardware will be capable of implementing optimal trajectories allowing more economical operation of process plants and automated manufacturing lines. Advanced control, guidance, and estimation methods will be introduced into operational

AD-A161 355

AD-A161 349

UNCLASSIFIED

PAGE 172

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A161 349 CONTINUED

AD-A161 343 12/1

systems rapidly since development times and risks will be reduced. Easy to use laboratory test tools will eventually change policymaker's decisions on appropriate funding levels for new complex systems development.  
(Author)

NORTH CAROLINA UNIV AT CHAPEL HILL DEPT OF STATISTICS  
(U) Existence of Random Variables with Values in the Dual of a Nuclear Space.

DESCRIPTIVE NOTE: Technical rept. Sep 85-Aug 88,

DESCRIPTORS: (U) \*ADAPTIVE CONTROL SYSTEMS, \*SYSTEMS ENGINEERING, \*COMPUTER PROGRAMMING, NONLINEAR SYSTEMS, INTEGRATION, COMPUTERIZED SIMULATION, CONTROL, COMPUTER AIDED DESIGN, ENGINEERING, TIME, COMPUTER PROGRAMS, INTERACTIONS, SYSTEMS ANALYSIS, ADAPTIVE CONTROL SYSTEMS, CONTROL THEORY, ESTIMATES, METHODOLOGY, LABORATORY TESTS, TEST EQUIPMENT, OPTIMIZATION, TRAJECTORIES, PROCESSING EQUIPMENT, REAL TIME, CONTROL THEORY, VALIDATION, TUNING

SEP 85 10P

PERSONAL AUTHORS: Ramaswamy, S. ;

REPORT NO. TR-118

CONTRACT NO. F49620-82-C-0009

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-85-0957

IDENTIFIERS: (U) Robustness, CACSD(Computer Aided Control System Design), PE81102F, WUAFOSR3005A1

UNCLASSIFIED REPORT

ABSTRACT: (U) The aim of this article is to apply some results of L. Schwartz's theory of radonifying maps to prove existence theorems for infinite dimensional valued random variables. As a consequence, we deduce some known results in this direction due to K. Ito, M. Perez-Abreu C., and T. Bojdecki and L.G. Gorostiza.

DESCRIPTORS: (U) \*RANDOM VARIABLES

IDENTIFIERS: (U) Schwartz theory, Existence theorems, WUAFOSR2304A5, PE81102F

AD-A161 349

AD-A161 343

UNCLASSIFIED

PAGE 173

EVK551

UNCLASSIFIED

OTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A181 341 12/1

AD-A181 338 11/2

FLORIDA STATE UNIV TALLAHASSEE DEPT OF STATISTICS

(U) Efficiency Loss with the Kaplan-Meier Estimator.

DESCRIPTIVE NOTE: Technical rept..

AUG 85 22P

PERSONAL AUTHORS: Hollander, Myles ; Proschan, Frank ;  
Sconing, James ;

REPORT NO. FSU-STATISTICS-M707, TR-85-181

CONTRACT NO. F49820-85-C-0007, AFOSR-85-C-0007

MONITOR: AFOSR  
TR-85-0875

UNCLASSIFIED REPORT

ABSTRACT: (U) We consider the proportional hazards model where the distribution G of the censoring random variable is related to the distribution F of the lifetime random variable via  $(1 - G) = (1 - F)$  to the beta power. Nonparametric estimators of F are developed for the case where beta is unknown and the case where beta is known. Of interest in their own right, these estimators also enable us to study the robustness of the Kaplan-Meier estimator (KME) in a nonparametric model for which it is not the preferred estimator. Comparisons are based on asymptotic efficiencies and exact mean square errors. We also compare the KME to the empirical survival function, thereby providing, in a nonparametric setting, a measure of the loss in efficiency due to the presence of censoring. Keywords: Censored model; Kaplan-Meier estimator; Proportional hazards.

DESCRIPTORS: (U) \*NONPARAMETRIC STATISTICS, \*ESTIMATES, EFFICIENCY, ERRORS, FUNCTIONS, HAZARDS, LOSSES, MEAN, POWER, SURVIVAL(GENERAL), MATHEMATICAL MODELS, RANDOM VARIABLES, CENSORSHIP, DISTRIBUTION

IDENTIFIERS: (U) \*Kaplan Meier estimators, Robustness, WJAFOSR2304A5, PE81102F

AD-A181 341

UNCLASSIFIED

PAGE 174 EVK551

GENERAL ELECTRIC CORPORATE RESEARCH AND DEVELOPMENT  
SCHENECTADY NY

(U) Development of Spacecraft Materials and Structures  
Fundamentals.

DESCRIPTIVE NOTE: Final scientific rept. 1 Jun 84-31 May 85,

AUG 85 87P

PERSONAL AUTHORS: Prochazka, S. ; Dole, S. L. ;

REPORT NO. SRD-85-021

CONTRACT NO. F49820-83-C-0101

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-85-0974

UNCLASSIFIED REPORT

ABSTRACT: (U) Compacts of boron carbide powders with specific surface area = or > 8 sq m/g were sintered in argon at temperatures near 2200 C. Several of these powders were prepared by attrition milling of abrasive grade boron carbide. Densification to 95+% of theoretical density could be obtained only with compositions that had appropriate amounts of excess carbon. The microstructures were finely grained and uniform but underwent abnormal grain growth above 2235 C accompanied by transgranular microcracking. This grain growth could be inhibited by increasing the carbon content. Mechanical damping capacity was measured by the free beam and cantilevered beam techniques on boron carbide and other materials. Methods to enhance the damping capacity in a beam structure were analyzed. The flexural strength of sintered boron carbide was evaluated and related to powder processing and sintering parameters. (Author)

DESCRIPTORS: (U) \*BORON CARBIDES, \*SPACECRAFT COMPONENTS, ABNORMALITIES, GRAIN GROWTH, ARGON, BEAMS(STRUCTURAL), POWDERS, CARBON, CAPACITY(QUANTITY), DAMPING, FLEXURAL STRENGTH, FINE GRAINED MATERIALS, ABRASIVES, ATTRITION,

AD-A181 338

UNCLASSIFIED

OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A161 338 CONTINUED

AD-A161 337 12/1

CUTTING, CANTILEVER BEAMS, MATERIALS, MICROSTRUCTURE,  
POWDERS, SINTERING, SURFACES

NORTH CAROLINA UNIV AT CHAPEL HILL DEPT OF STATISTICS  
(U) On the Distance between Mixed Poisson and Poisson  
Distributions.

IDENTIFIERS: (U) Compacts(Materials), Densification,  
WUAFOSR2303A3, PE81102F

DESCRIPTIVE NOTE: Technical rept. Sep 85-Aug 88.

SEP 85 20P

PERSONAL AUTHORS: Pfeifer,Dietmar ;

REPORT NO. TR-115

CONTRACT NO. F49620-82-C-0009, F49620-85-C-0144

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-85-0956

UNCLASSIFIED REPORT

ABSTRACT: (U) Estimations and asymptotic expansions for several distances between mixed Poisson and Poisson distributions are given, such as the total variation distance, the Kolmogorov distance and a specific Wasserstein distance (Fortet-Mourier distance). As an example, the author generalizes and improves results of Vervaat (1989) on the total variation distance between negative binomial and Poisson distributions. The main tool is an appropriate application of operator semigroups and their probabilistic representation theory. Keywords: Poisson approximation; Banach space; Stochastic processes. (Author)

DESCRIPTORS: (U) \*POISSON DENSITY FUNCTIONS,  
APPROXIMATION(MATHEMATICS), OPERATORS(MATHEMATICS),  
BANACH SPACE, ESTIMATES, DISTRIBUTION, STOCHASTIC  
PROCESSES, BINOMIALS, PROBABILITY, THEORY, RANGE(DISTANCE)  
, VARIATIONS

IDENTIFIERS: (U) WUAFOSR2304A5, PE81102F

AD-A161 338

AD-A161 337

UNCLASSIFIED

PAGE 175 EVK551

## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A181 334

12/1

AD-A181 328

12/1

MASSACHUSETTS INST OF TECH CAMBRIDGE LAB FOR INFORMATION  
AND DECISION SYSTEMS

PITTSBURGH UNIV PA

(U) A Final Technical Report of Research on under Grant  
AFOSR-82-0135.(U) Inference for Thinned Point Processes, with  
Application to Cox Processes.

JUN 85 26P

DESCRIPTIVE NOTE: Rept. for 15 Mar 84-15 Mar 85.

PERSONAL AUTHORS: Mitter, Sanjoy K. ; Levy, Bernard ;

PERSONAL AUTHORS: Karr, Alan F. ; Krishniah, P. R. ;

JUN 85 22P

CONTRACT NO. AFOSR-82-0135

CONTRACT NO. AFOSR-82-0029

PROJECT NO. 2304

PROJECT NO. 2304

TASK NO. A1

TASK NO. A5

MONITOR: AFOSR

MONITOR: AFOSR  
TR-85-0976

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Multivariate Analysis,  
v18 n3 p388-392 Jun 85.

ABSTRACT: (U) This report is concerned with the following fundamental aspects of Stochastic Systems Theory: Filtering, Statistical Signal Processing and related Problems in Scattering and Inverse Scattering Theory; Theory of Markov Random Fields and related questions in Image Processing and Image Understanding; Stochastic Variational Calculus and Stochastic Adaptive Control; and Parallel and Distributed Algorithms for Statistical Signal Processing.

ABSTRACT: (U) The topics of this reprint are statistical inference and state estimation for thinned point processes, especially Cox processes. Observation of a thinning of a point process represents a form of partial observation analogous in some senses to problems of missing data in the classical context of a random sample and in other senses to problems involving censored data. The thinning mechanism analyzed here is general enough to admit wide applicability in modeling, yet specific enough to permit precise results: points of an underlying point process  $N$  are deleted independently of one another but with probabilities depending on their locations. The resultant thinned point process  $N$  (specifically, i.i.d. copies of  $N$ ) is observable and from these observations it is desired to perform inference concerning the probability law of  $N$  and the thinning function  $p(x)$  (a point of  $N$  at  $x$  epsilon  $E$  is retained in  $N$  with probability  $p(x)$ ).

DESCRIPTORS: (U) \*STOCHASTIC PROCESSES, MATHEMATICAL FILTERS, IMAGE PROCESSING, MARKOV PROCESSES, SIGNAL PROCESSING, STATISTICAL PROCESSES, CALCULUS, THEORY, ALGORITHMS, DISTRIBUTION, ADAPTIVE CONTROL SYSTEMS, STOCHASTIC CONTROL

IDENTIFIERS: (U) PE61102F, WUAFOSR2304A1

DESCRIPTORS: (U) \*STATISTICAL INFERENCE, MATHEMATICAL MODELS, REPRINTS, OBSERVATION, PROBABILITY, ESTIMATES

IDENTIFIERS: (U) \*Thinned point processes, Cox processes, WUAFOSR2304A5, PE61102F

AD-A181 334

AD-A181 328

## UNCLASSIFIED

PAGE 178

EVK551

UNCLASSIFIED

AD-A181 322 12/1 DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551  
AD-A181 322 CONTINUED

FLORIDA STATE UNIV TALLAHASSEE DEPT OF STATISTICS

(U) Piecewise Geometric Estimation of a Survival Function.

DESCRIPTIVE NOTE: Technical rept..

APR 85 50P

PERSONAL AUTHORS: Mimmack, Gillian M.; Proschan, Frank;

REPORT NO. FSU-STATISTICS-M700, TR-178

CONTRACT NO. F49820-82-K-0007

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-85-0953

UNCLASSIFIED REPORT

ABSTRACT: (U) This document describes a statistical procedure that uses incomplete data to estimate failure rate and survival functions. Although the procedure is designed for discrete distributions, it applied in the continuous case also. This description is expository and therefore contains no proofs: they are provided by Mimmack (1985). The procedure is based on the assumption of a piecewise constant failure rate. The resultant survival function estimator is a piecewise geometric function, denoted the Piecewise Geometric Estimator (PEGE).

The PEGE is the discrete version of the piecewise exponential estimators proposed independently by Kitchin, Langberg and Proschan (1983) and Whittemore and Keller (1983), and it is a generalization of an estimator of Unholtz (1984) who considers complete data taken from an exponential distribution. The PEGE is consistent and asymptotically normal under conditions more general than those of the model of random censorship. Although the PEGE and the widely used Kaplan-Meier estimator (KME) are asymptotically equivalent and generally interlace, the PEGE is expected to perform better than the KME in terms of small sample properties. The PEGE is attractive to users because it is computationally simple and realistic in that it decreases at every possible failure time; it therefore no only has the appearance of a survival

function, but also provides a realistic estimate of the failure rate function. The KME, in contrast, is a step function. Keywords: pilot studies; Monte Carlo method.

DESCRIPTORS: (U) \*DISCRETE DISTRIBUTION, ESTIMATES, GEOMETRY, MATHEMATICAL MODELS, MONTE CARLO METHOD, ASYMPTOTIC NORMALITY, RATES, CENSORSHIP

IDENTIFIERS: (U) \*Survival functions, Kaplan Meier estimator, PE61102F, WUAFOSR2304A5

AD-A181 322

AD-A181 322

UNCLASSIFIED

PAGE 177

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A161 317 7/4 7/5

AD-A161 317 CONTINUED

STATE UNIV OF NEW YORK AT BUFFALO DEPT OF CHEMISTRY

(U) Molecular Mechanics of Photopolymerization of 2,5-Distyrylpyrazine in Solid state.

84 14P

PERSONAL AUTHORS: Swiatkiewicz, Jacek ; Prasad, Paras N. ;

CONTRACT NO. AFOSR-82-0118

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-85-0918

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Polymer Science: Polymer Physics Edition, v22 p1417-1429 1984.

ABSTRACT: (U) The molecular mechanics of photopolymerization of 2,5-distyrylpyrazine in the solid-state alpha form is investigated by a combination of Raman and electronic spectroscopic techniques. A stepwise photoreaction is used to stabilize an intermediate oligomer structure. For this purpose, the 478.5-nm argon-ion laser line is used to convert the monomer to the oligomer. The Raman phonon spectra reveal a homogeneous mechanism, with considerable lattice rearrangement, for the oligomerization process, which is also found to produce lattice strain. Further photoreaction of the oligomer is carried out with light of wavelength  $\lambda < 400$  nm from a 200-W mercury-xenon lamp as well as with the 355- and 417-nm laser lines from a Nd:Yag laser system. The Raman phonon spectra, monitored during the conversion of the oligomer to the polymer, show that initially the process starts homogeneously, with considerable lattice rearrangement. Then it turns heterogeneous, with a phase separation spectra accompanied by a gradual ordering of the polymer product lattice. The electronic absorption spectra of the monomer are characterized and related to the stepwise photoprocess discussed above. Although the emission spectra show a monotonic change during the photoreaction, energy transfer from the oligomer to the monomer and from

AD-A161 317

AD-A161 317

UNCLASSIFIED

PAGE 178

EVK551



## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A161 316

7/4

ROCHESTER UNIV NY DEPT OF CHEMISTRY

AD-A161 315 20/13 20/4

YALE UNIV NEW HAVEN CT DEPT OF CHEMICAL ENGINEERING

(U) Multiple Resonances in Non-Franck-Condon Transitions due to Nonlocal Effects in Laser-Induced Associative Ionization,

SEP 85 8P

84 12P

PERSONAL AUTHORS: Lam, Kai-Shue ; George, Thomas F. ;

PERSONAL AUTHORS: Ryall, S. B. ; Venkateshan, S. P. ; Fenn, J. B. ;

CONTRACT NO. AFOSR-82-0048, NSF-CHE83-20185

CONTRACT NO. F49620-85-C-0085, NSF-CPE79-10843

PROJECT NO. 2303

PROJECT NO. 2303

TASK NO. B3

TASK NO. B1

MONITOR: AFOSR  
TR-85-0928

MONITOR: AFOSR  
TR-85-0895

## UNCLASSIFIED REPORT

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Physical Review A, v32 n3  
p1650-1658 Sep 85.

SUPPLEMENTARY NOTE: Pub. in Proceedings of the International Symposium on Rarefield Gas Dynamics (14th) Held on 16-20 Jul 84 at Tsukuba Science City, Japan, p567-576.

ABSTRACT: (U) The laser-induced associative ionization process  $A^+ + B + (h\nu) \rightarrow (AB)^+ + e^-$  is investigated using a nonlocal scattering potential. It is found that for each vibrational level of the ion complex  $AB^+$  multiple resonances for association can occur as the laser frequency is varied, provided the laser intensity is beyond a certain critical value, estimated to be on the order of  $10^7$  W/cm<sup>2</sup> for alkali diatomic systems. The locations of the resonances also depend crucially on the laser intensity. These results are contrary to the Franck-Condon assumption of localized electronic transitions, which predicts a single resonance for each vibrational level. Keywords: Associative ionization; Laser-induced multiple resonances; Non-Franck-Condon; Nonlocal effects; Quantum theory; Reprints.

ABSTRACT: (U) By means of Fourier Transform Infrared Spectrometry we have determined determined terminal distributions of rotational energy for carbon monoxide and carbon dioxide in supersonic free jets. Results from both emission and absorption measurements indicate marked departures from a Boltzmann distribution. It appears that these departures can be understood in terms of a competition between Rotation-Rotation (RR) and Rotation-Translation (PT) transfers. (Reprints)

DESCRIPTORS: (U) \*JET FLOW, \*AEROTHERMODYNAMICS, \*CARBON DIOXIDE, \*INFRARED SPECTROSCOPY, PROBABILITY DISTRIBUTION FUNCTIONS, ABSORPTION, FOURIER TRANSFORMATION, ENERGY, ROTATION, BOLTZMANN EQUATION, CARBON MONOXIDE, REPRINTS

DESCRIPTORS: (U) \*LASER INDUCED FLUORESCENCE, \*IONIZATION, \*RESONANCE, ALKALI METAL COMPOUNDS, DIATOMIC MOLECULES, LASERS, ASSOCIATIVE PROCESSING, SCATTERING, REPRINTS, LEVEL(QUANTITY), VIBRATION, QUANTUM THEORY

IDENTIFIERS: (U) PE81102F, WUAFOSR230383

IDENTIFIERS: (U) PE81102F, WUAFOSR230381

AD-A161 316

AD-A161 315

## UNCLASSIFIED

PAGE 179

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A161 314 20/4 20/13

AD-A161 313 20/10 7/4

YALE UNIV NEW HAVEN CT DEPT OF CHEMICAL ENGINEERING

MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF CHEMISTRY

(U) Clustering in Free Jets - Aggregation by Dispersion,  
84 10P

(U) Intramolecular Vibrational Dynamics Including  
Rotational Degrees of Freedom. Chaos and Quantum  
Spectra.

PERSONAL AUTHORS: Ryall, S. B. ; Fenn, J. B. ;

FEB 85 4P

CONTRACT NO. F49620-85-C-0065, NSF-ENG79-10843

PERSONAL AUTHORS: Dai, Hai-Lung ; Field, Robert W. ; Kinsey,  
James L. ;

PROJECT NO. 2303

CONTRACT NO. F49620-83-C-0010

TASK NO. B1

PROJECT NO. 2303

MONITOR: AFOSR  
TR-85-0893

TASK NO. B1

UNCLASSIFIED REPORT

MONITOR: AFOSR  
TR-85-0881

SUPPLEMENTARY NOTE: Pub. in Berichte Bunsengesellschaft  
für Physikalische Chemie, v88 p245-253 1984.

UNCLASSIFIED REPORT

ABSTRACT: (U) The nature of free jet expansion is  
reviewed with emphasis on those features that are  
important in the clustering process. Thermodynamic and  
kinetic aspects are examined. The importance of nozzle  
geometry is discussed along with some of the implications  
of the newly developing pulsed flow technique. Some  
problems relating to free jet sampling into vacuum from  
high pressure are identified. Keywords: Clusters; Free  
jets; Molecular beams; Nucleation; Reprints.

DESCRIPTORS: (U) \*NOZZLE GAS FLOW, THERMODYNAMIC  
PROPERTIES, EXPANSION, JET FLOW, NOZZLE CLUSTERS,  
CLUSTERING, HIGH PRESSURE, GEOMETRY, NOZZLES, REPRINTS,  
FLOW, PULSES, MOLECULAR BEAMS, NUCLEATION, VACUUM

IDENTIFIERS: (U) Free jet expansion, PE81102F,  
WUAFOSR2303B1

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v82  
n4 p2161-2163, 15 Feb 85.

ABSTRACT: (U) A criterion for chaos in quantum spectra  
developed by Heller et al. is applied to the vibration-  
rotation spectrum at about 8000/cm of the X. 1A1 state of  
formaldehyde. It is found that the observed increase in  
complexity in the spectrum as the angular momentum  
quantum numbers are increased corresponds nonetheless  
with decreasingly stochastic behavior. This can be  
understood in terms of an available phase volume that  
expands more rapidly than the occupied phase space volume  
as J increases. Keywords: Laser spectroscopy;  
Formaldehyde; Highly Excited vibrational levels; Quantum  
Ergodicity; Intramolecular Redistribution; Reprints.

DESCRIPTORS: (U) \*EMISSION SPECTRA, \*QUANTUM THEORY,  
\*FORMALDEHYDE, ENTROPY, MOLECULAR VIBRATION, MOLECULAR  
ROTATION, ANGULAR MOMENTUM, EIGENVALUES, LASERS,  
SPECTROSCOPY, ERGODIC PROCESSES, REPRINTS, BEHAVIOR,  
STOCHASTIC PROCESSES, VOLUME, SPECTRA, DEGREES OF FREEDOM

IDENTIFIERS: (U) \*Laser spectroscopy, Chaos, PE81102F,  
WUAFOSR2303B1

AD-A161 314

AD-A161 313

UNCLASSIFIED

PAGE 180

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A161 305

20/11

AD-A161 305 CONTINUED

PURDUE UNIV LAFAYETTE IN SCHOOL OF AERONAUTICS AND  
ASTRONAUTICS

physically small cracks, which were expected to behave  
differently than large cracks.

(U) Initiation, Growth, and Coalescence of Small Fatigue  
Cracks.

DESCRIPTORS: (U) \*CRACK PROPAGATION, MATHEMATICAL  
PREDICTION, COMPUTERIZED SIMULATION, GROWTH(GENERAL),  
DEFECTS(MATERIALS), COMPUTER PROGRAMS, CRACKS,  
INTERACTIONS, CYCLES, LOADS(FORCES), FATIGUE  
TESTS(MECHANICS), COALESCENCE, CONTROL, DATA BASES,  
SOLUTIONS(GENERAL), STRESS CONCENTRATION

DESCRIPTIVE NOTE: Final scientific rept. 14 Jan 82-14 Jan  
85.

JUL 85 49P

IDENTIFIERS: (U) \*Fatigue cracks, PE81102F,  
WUAFOSR230782

PERSONAL AUTHORS: Grandt, Alten F., Jr;

CONTRACT NO. AFOSR-82-0041

PROJECT NO. 2307

TASK NO. B2

MONITOR: AFOSR  
TR-85-0963

UNCLASSIFIED REPORT

ABSTRACT: (U) The objective of this effort was to  
determine the manner in which small fatigue cracks  
initiate at notches, extended by cyclic loading, interact  
with adjacent flaws, and coalesce into a single dominant  
crack which controls final fracture. The desired product  
was a predictive scheme capable of analyzing the early  
stages of fatigue crack growth which are characterized by  
the growth and link-up of small cracks. Research toward  
this goal was directed at the following tasks: 1) Crack  
Growth Predictive Algorithm - A computer program was  
developed to predict the growth and coalescence of  
multiple cracks located at notches; 2) Crack Interaction  
Analysis - Stress intensity factors solutions were  
computed for multiple cracks located at an open hole.  
These solutions were required for the multiple crack  
growth algorithm; 3) Crack Coalescence Experiments -  
Fatigue tests were conducted with multiply cracked  
specimens to provide a data base to evaluate the  
predictive model. The model was verified with large crack  
results directed toward coalescence aspects of the  
problem as well as small crack experiments which focused  
on the initial stages of fatigue crack growth; and 4)  
Characterization of Small Cracks - This phase of the  
effort was directed toward the growth and coalescence of

AD-A161 305

AD-A161 305

UNCLASSIFIED

PAGE 181

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A161 298 CONTINUED

AD-A161 298 9/1 9/3

TEXAS TECH UNIV LUBBOCK DEPT OF MECHANICAL ENGINEERING

(U) The Influence of Fluid Mechanics on the Behavior of Gas-Blown Spark Gap Switches.

DESCRIPTIVE NOTE: Final rept. 30 Sep 82-31 Jan 85.

MAR 85 78P

PERSONAL AUTHORS: Carper, Herbert J. . Jr.; Maxwell, Timothy T. ;

CONTRACT NO. AFOSR-82-0327

PROJECT NO. 2301

TASK NO. A7

MONITOR: AFOSR  
TR-85-0803

UNCLASSIFIED REPORT

ABSTRACT: (U) A research facility was designed and constructed to conduct experiments to determine the influence of fluid mechanics on the performance of gas-blown spark gap switches. The effects of gas flow velocity, electrode divergence angle and hydrodynamic boundary layer development were investigated for laminar flow in a switch consisting of a pair of electrodes mounted in a diverging nozzle configuration. The results of the experiments show that for a given set of operating conditions, a threshold gap velocity exists, and increasing the velocity above this value results in no improvement in switch performance. This threshold velocity is exponentially dependent on the electrode divergence angle, an increase in the latter resulting in a lower threshold velocity. The threshold velocity was found to vary nonmonotonically with the degree of hydrodynamic boundary layer development at the point of minimum gap spacing, and for the conditions investigated there is an optimum hydrodynamic entry length that results in a minimum threshold velocity. The effects of turbulence were investigated briefly with the results showing an improvement in switch performance with turbulence. A numerical model was developed to predict the transient gas density distribution produced in the flow by the arc. The results of the model prediction are

AD-A161 298

AD-A161 298

UNCLASSIFIED

PAGE 182

EVK551

compared with interferograms obtained during the experiments. Keywords: Pulsed power; Switching; Spark gaps.  
DESCRIPTORS: (U) \*GAS BREAKDOWN, \*ELECTRIC SWITCHES, \*SPARK GAPS, FLUID CONTROL, TURBULENCE, FLOW RATE, GAS FLOW, INTERFEROGRAMS, LOW VELOCITY, THRESHOLD EFFECTS, CONFIGURATIONS, NOZZLES, ELECTRODES, FLUID MECHANICS, BOUNDARY LAYER, HYDRODYNAMICS, LAMINAR FLOW, PREDICTIONS, MATHEMATICAL MODELS, POWER, PULSES, TURBULENCE, DENSITY, DISTRIBUTION, GASES, TRANSIENTS

IDENTIFIERS: (U) AFSOR2301A7, PE81102F

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A161 292 14/2 13/8

AD-A161 285 20/11

STANFORD UNIV CA EDWARD L GINZTON LAB OF PHYSICS

CARNEGIE-MELLON UNIV PITTSBURGH PA DEPT OF MECHANICAL  
ENGINEERING

(U) Electromagnetic Sensor Arrays for Nondestructive  
Evaluation and Robot Control.

DESCRIPTIVE NOTE: Annual rept. 1 Sep 84-31 Aug 85.

OCT 85 23P

JUL 85 117P

PERSONAL AUTHORS: Auld, B. A. ; Kenney, J. ; Lookabaugh, T. ;  
Gimple, M. ;

PERSONAL AUTHORS: Sinclair, G. B. ;

CONTRACT NO. F49620-84-C-0095

REPORT NO. SM-85-14

PROJECT NO. 2306

CONTRACT NO. AFOSR-84-0047

TASK NO. A2

PROJECT NO. 2307

MONITOR: AFOSR

TASK NO. B2

TR-85-0970

MONITOR: AFOSR

TR-85-0942

UNCLASSIFIED REPORT

ABSTRACT: (U) A conceptual base is being developed for the design of inductive (eddy-current) and capacitive sensor arrays capable of providing multifunction sensing, including proximity, tactile and edge recognition. Flaw detection and characterization is also included. The physical base for design is the electromagnetic reciprocity relation, which permits configuration of the probe structure to achieve desired performance characteristics. In this report the design, construction and testing of a novel 5-coil inductive sensor is described, and experimental results are given for its edge sensing function.

DESCRIPTORS: (U) \*RECOGNITION, \*DETECTORS, \*NONDESTRUCTIVE TESTING, \*ARRAYS, \*ROBOTS, CONTROL, DEFECTS(MATERIALS), DETECTION, EDGES, ELECTROMAGNETIC RADIATION, FUNCTIONS, PHYSICAL PROPERTIES, PROBES, STRUCTURAL PROPERTIES

IDENTIFIERS: (U) PE81102F, WUAFOSR2306A2

AD-A161 292

AD-A161 285

UNCLASSIFIED

PAGE 183

EVK551

UNCLASSIFIED REPORT

ABSTRACT: (U) Dimensionless elastic fracture mechanics - the nondimensionalized counterpart to linear elastic fracture mechanics (LEFM) - predicts size-independent strengths for geometrically similar specimens. This is in contrast to LEFM which has that the stress at fracture reduces as the inverse square root of the in-plane scale factor. It is shown that neither agrees with the data, irrespective of how brittle material response is. Used predictions is possible. However, both are essentially inadequate, since they lack valid underlying physical reasoning and, even as merely empirically based approaches, are short of sufficient accuracy to be reliable in practice. There is a need, therefore, to critically examine the very foundations of elastic fracture mechanics. Keywords: Notched specimens; Stress concentration; Crack propagation. (Author)

DESCRIPTORS: (U) \*ELASTIC PROPERTIES, \*FRACTURE(MECHANICS), BRITTLENESS, CRACK PROPAGATION, INVERSION, LINEARITY, MATERIALS, MECHANICS, PHYSICAL PROPERTIES, REASONING, RESPONSE, SQUARE ROOTS, STRESS CONCENTRATION, STRESSES, PREDICTIONS

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A161 285

CONTINUED

AD-A161 284 7/4 7/3

IDENTIFIERS: (U) WJAFOSR230782, PE61102F

MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF CHEMISTRY

(U) Rotation-Induced Vibrational Mixing in X' 1A1  
Formaldehyde: Non-Negligible Dynamical Consequences of  
Rotation.

FEB 85 16P

PERSONAL AUTHORS: Dai, H. L. ; Korpa, C. L. ; Kinsey, J. L. ;  
Field, R. W. ;

CONTRACT NO. F49620-83-C-0010

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-85-0888

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v82  
n4 p1688-1701, 15 Feb 85.

ABSTRACT: (U) Individual rotation-vibration levels of  
the formaldehyde X superscript 1 A sub 1 state with 7400  
< E sub vib < 8600/cm have been examined by the  
stimulated emission pumping (SEP) technique. At low  
values of the rotational quantum number (J < or = 3), the  
SEP spectra were simple. The only vibrational levels  
which appeared in the spectra were those expected either  
to have large Franck-Condon overlap with the A 4  
superscript 1 level or to have appreciable Fermi  
resonance with a nearby Franck-Condon allowed level. At  
higher J and K sub a values, the spectra rapidly became  
more complex and the observed level densities at J approx  
10, K sub a approx 2 were several times larger than the  
known total density of vibrational levels. This increase  
in the density of spectrally accessible vibrational  
levels was a result of rotation-induced mixing of the  
anharmonic vibrational basis functions (Coriolis coupling)  
which comprised the goodness of both vibrational and K  
sub a quantum numbers. Coriolis matrix elements computed  
in a harmonic normal mode basis set qualitatively  
confirmed the importance of rotation-vibration mixing.  
The failure to obtain quantitative agreement is  
attributed to anharmonic effects. The rotation-dependent

AD-A161 285

AD-A161 284

UNCLASSIFIED

PAGE 184

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A161 284

CONTINUED

vibrational mixing effects observed in the SEP spectra indicate the importance of rotation in intramolecular vibrational dynamics and mode-selective vibrational excitation.

DESCRIPTORS: (U) \*MOLECULAR ENERGY LEVELS, \*ELECTRONIC STATES, \*MOLECULAR VIBRATION, \*FORMALDEHYDE, EXCITATION, CORIOLIS EFFECT, COUPLING(INTERACTION), FERMI SURFACES, RESONANCE, HARMONICS, QUANTUM THEORY, ROTATION, DENSITY, VIBRATION, EIGENVALUES, QUANTUM THEORY, EMISSION, PUMPING, STIMULATION(GENERAL), REPRINTS

IDENTIFIERS: (U) PE81102F, WUAFOSR230381

AD-A161 283

20/4

YALE UNIV NEW HAVEN CONN

(U) On the Time Required to Reach Fully Developed Flow in Pulsed Supersonic Free Jets,

DEC 83

4P

PERSONAL AUTHORS: Saenger, Katherine L. ; Fenn, John B. ;

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-85-0892

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v79  
n12 p8043-8045, 15 Dec 83.

ABSTRACT: (U) A new and simple model is presented for estimating the minimum pulse duration ('value open time') required for a pulsed nozzle to produce a supersonic beam comparably 'cold' to that obtained from a continuous source. The model is based on the notion that cooling will be complete if the leading edge of the beamlet reaches the terminal temperature prescribed by the steady state flow equations before the sound wave created at the back of the pulse by the nozzle's closing up with the leading edge. The times predicted from this model for reasonable stagnation conditions are all approx. or < 10 microseconds.

DESCRIPTORS: (U) \*JET FLOW, \*MOLECULAR BEAMS, PULSES, SUPERSONIC FLOW, NOZZLE GAS FLOW, LEADING EDGES, GAS DYNAMICS, STAGNATION TEMPERATURE, NOZZLE THROATS, ACOUSTIC VELOCITY, MACH NUMBER, TIME, REPRINTS

IDENTIFIERS: (U) Pulsed jet flow, Supersonic free jets,  
PE81102F, WUAFOSR230381

AD-A161 284

AD-A161 283

UNCLASSIFIED

PAGE 185

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A181 275 20/12 20/9 AD-A181 275 CONTINUED

WESTINGHOUSE RESEARCH AND DEVELOPMENT CENTER PITTSBURGH  
PA

IDENTIFIERS: (U) Plasma deposition, PE81102F,  
WUAFOSR230682

(U) Plasma Deposition of Silicon Carbide Thin Films.

DESCRIPTIVE NOTE: Annual technical rept. no. 1, 1 Jul 84-  
30 Jun 85,

JUL 85 20P

PERSONAL AUTHORS: Partlov, W. D. ; Choyke, W. J. ; Yates, John  
T. , Jr. ; Kline, L. E. ; Bozack, M. J. ;

CONTRACT NO. F49620-84-C-0083

PROJECT NO. 2308

TASK NO. B2

MONITOR: AFOSR  
TR-85-0989

UNCLASSIFIED REPORT

ABSTRACT: (U) During this reporting period we completed the adaptation of experimental equipment required for three related areas of the research program: understanding plasma deposition chemistry and physics, characterization of plasma deposited thin films, and surface chemistry of elemental deposition processes. In the plasma studies area, extensive experiments were conducted on methane plasmas, and experiments were begun on methane-silane plasmas. We achieved significant anisotropy in the deposition chemistry by controlling electrode bias and the data are being compared to a theoretical model produced in a collaborative effort by L. E. Kline at Westinghouse R&D Center. We have selected characterization techniques for the thin films produced with these plasmas, and measurements have begun. The UHV apparatus for surface chemistry was acquired, assembled, and tested, and initial measurements of the desorption of organic gases were completed.

DESCRIPTORS: (U) \*PLASMAS(PHYSICS), \*THIN FILMS,  
\*SILICON CARBIDES, VAPOR DEPOSITION, SILANES, ORGANIC  
COMPOUNDS, ANISOTROPY, DESORPTION, GASES, METHANE,  
DEPOSITION, CHEMISTRY, BIAS, ELECTRODES, PHYSICS, SURFACE  
CHEMISTRY, MODELS, SURFACES

AD-A181 275

AD-A181 275

UNCLASSIFIED

PAGE 188

EVK551



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A181 273 12/1

AD-A181 273 CONTINUED

FLORIDA STATE UNIV TALLAHASSEE DEPT OF STATISTICS

IDENTIFIERS: (U) PE81102F, WUAFOSR2304A5

(U) Moment and Geometric Probability Inequalities Arising  
from Arrangement Increasing Functions.

DESCRIPTIVE NOTE: Technical rept..

AUG 85 13P

PERSONAL AUTHORS: Boland, Philip J. ; Proschan, Frank ; Tong,  
Y. L. ;

REPORT NO. FSU-STATISTICS-M708, TR-85-182-AFOSR

CONTRACT NO. F49820-85-C-0007, AFOSR-84-0113

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-85-0952

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Sponsored in part by Grant NSF-DMS85-  
02346. Prepared in cooperation with Georgia Inst. of Tech.  
. Atlanta, School of Mathematics.

ABSTRACT: (U) A real valued function  $g$  of two vector  
arguments  $x$  and  $y$   $\epsilon$   $R^n$  is said to be  
arrangement increasing if it increases in value as the  
arrangement of components in  $x$  becomes increasingly  
similar to the arrangement of components in  $y$ . Hollander,  
Proschan and Sethuraman (1977) show that the composition  
of arrangement increasing functions is arrangement  
increasing. This result is used to generate some  
interesting probability inequalities of a geometric  
nature for exchangeable random vectors. Other geometric  
inequalities for families of arrangement increasing  
multivariate densities are also given and some moment  
inequalities are also given, and some moment inequalities  
are obtained. (Author)

DESCRIPTORS: (U) \*INEQUALITIES, DENSITY, GEOMETRY,  
MOMENTS, MULTIVARIATE ANALYSIS, PROBABILITY,  
FUNCTIONS(MATHEMATICS), VECTOR ANALYSIS

AD-A181 273

AD-A181 273

UNCLASSIFIED

PAGE 187

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A161 271 9/5 13/8 9/2 AD-A161 271 CONTINUED

CARNEGIE-MELLON UNIV PITTSBURGH PA

IDENTIFIERS: (U) VLSI(Very Large Scale Integration),  
PEB1102F, WUAFOSR2305C1

(U) A Program of Research on Microfabrication Techniques  
for VLSI Magnetic Devices.

DESCRIPTIVE NOTE: Final rept. 1 Oct 83-30 Sep 84.

NOV 84 296P

PERSONAL AUTHORS: Kryder, Mark H. ; Alex, M. ; Artman, J. ;  
Bauer, L. ; Campbell, R. ;

CONTRACT NO. AFOSR-80-0284

PROJECT NO. 2305

TASK NO. C1

MONITOR: AFOSR  
TR-85-0900

#### UNCLASSIFIED REPORT

ABSTRACT: (U) New materials, new fabrication techniques and new device structures for high density magnetic bubble devices were developed. The main focus of the work has been to develop ion implanted contiguous disk devices offering sixteen times the bit density of presently manufactured bubble devices and chip capacities of 64 Mbit. Under this contract the authors developed a computer program for modeling magnetic bubble garnet materials and have applied it to the design of bubble materials having isotropic magnetostriction. They have previously show that such materials would provide better device operating characteristics. During the past year they also modeled the anisotropic stresses around ion implanted propagation patterns and showed how they produce non-uniform anisotropies due to magnetostrictive effects. Contents: Magnetic Garnet Materials; Effects of Ion Implantation on Magnetic Garnets; and Microfabrication of High Density Magnetic Bubble Devices.

DESCRIPTORS: (U) \*FABRICATION, \*BUBBLE MEMORIES, \*MICROMINIATURIZATION, \*INTEGRATED CIRCUITS, ANISOTROPY, COMPUTER PROGRAMS, GARNET, ION IMPLANTATION, ISOTROPISM, MAGNETIC DEVICES, MAGNETIC FIELDS, MAGNETIC MATERIALS, MAGNETOSTRICTION, NONUNIFORM, PROPAGATION

AD-A161 271

AD-A161 271

UNCLASSIFIED

PAGE 188

EVK551

UNCLASSIFIED

OTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A161 270 12/1

NORTH CAROLINA UNIV AT CHAPEL HILL CENTER FOR STOCHASTIC PROCESSES

(U) Real Inversion Formulas for Laplace and Stieltjes Transforms.

DESCRIPTIVE NOTE: Technical rept. Sep 84-Aug 85.

JUL 85 18P

PERSONAL AUTHORS: Teugels, Jozef L. ;

REPORT NO. TR-111

CONTRACT NO. F49620-82-C-0009

PROJECT NO. 2304

TASK NO. A5

MONITOR: AFOSR  
TR-85-0849

UNCLASSIFIED REPORT

ABSTRACT: (U) We provide probabilistic proofs for a number of real inversion formulas for the Laplace and for the Stieltjes transform. The main drawback of the method used in this paper is that the relevant integral transform has to be recovered from a potential inversion formula. The main virtue of the paper lies in singling out the relevance of the asymptotic behavior of the sequence  $d_{sub n}$  for  $n$  to infinity; probabilistic arguments often provide this behavior immediately.

DESCRIPTORS: (U) \*LAPLACE TRANSFORMATION, PROBABILITY, FORMULAS(MATHEMATICS), SEQUENCES(MATHEMATICS), ASYMPTOTIC SERIES, INVERSION, SEQUENCES

IDENTIFIERS: (U) \*Stieltjes transformation, PEB1102F.  
WUAFOSR2304A5

AD-A161 270

UNCLASSIFIED

AD-A161 265 7/3

ARIZONA UNIV TUCSON CARL S MARVEL LABS OF CHEMISTRY

(U) Polyaromatic Ether-Ketones and Polyaromatic Ether-Keton Sulfonamides from 4-Phenoxybenzoyl Chloride and from 4,4'-Dichloroformyldiphenyl Ether.

85 20P

PERSONAL AUTHORS: Litter, Marta I. ; Marvel, Carl S. ;

CONTRACT NO. AFOSR-82-0007

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-85-0973

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Polymer Science, Polymer Chemistry Ed., v23 p2205-2223 1985.

ABSTRACT: (U) Polyaromatic ether-ketones possessing high thermal stabilities were prepared by Friedel-Crafts polymerizations from 4-phenoxybenzoyl chloride and from 4,4-dichloroformyldiphenyl ether and diphenyl ether. Sulfonation and subsequent sulfamidation of these polymers afforded polyaromatic ether-ketone sulfonamides with different degrees of substitution depending on the reaction conditions. Sulfonation reactions with chlorosulfonic acid did not cause much degradation on the polymers. The polysulfonamides were soluble in various organic solvents such as N,N-dimethylformamide, dimethylsulfoxide, or chloroform, and could be cast into transparent films. These polymers may be used as desalination membranes. (Author)

DESCRIPTORS: (U) \*ETHERS, \*KETONES, \*SULFONAMIDES, POLYMERS, SYNTHESIS(CHEMISTRY), MOLECULAR STRUCTURE, AROMATIC COMPOUNDS, THERMAL STABILITY, REPRINTS

IDENTIFIERS: (U) PEB1102F, WUAFOSR2303B1

AD-A161 265

PAGE 189 EVK551

## UNCLASSIFIED

AD-A181 258 20/6 4/1 17/5 DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A161 256 7/4 7/5

TECHNION - ISRAEL INST OF TECH HAIFA DEPT OF PHYSICS

SRI INTERNATIONAL MENLO PARK CA

(U) Measurement of Atmospheric Transmission Over Long Paths in the Infrared Spectral Region.

(U) Production and Properties of Metastable Autodetaching Negative Ions.

DESCRIPTIVE NOTE: Final scientific rept. 1 Jan 84-31 Mar 85,

DESCRIPTIVE NOTE: Final scientific rept. 15 May 82-14 Jun 85,

APR 85 21P

AUG 85 27P

PERSONAL AUTHORS: Oppenheim, U. P. ; Lipson, S. G. ;

PERSONAL AUTHORS: Peterson, James R. ; Coggioia, Michael J. ;

CONTRACT NO. AFOSR-83-0023

REPORT NO. SRI-MP-203

MONITOR: AFOSR

CONTRACT NO. F49620-82-K-0030

TR-85-0890

PROJECT NO. 2301

UNCLASSIFIED REPORT

TASK NO. A7

ABSTRACT: (U) A field experiment was carried out in the coastal plain of Israel, near the settlement of Palmachim, about 20 km south of Tel Aviv. The Palmachim experiment was carried out over a north-south optical path of 8.6 km length, along the shore of the Mediterranean. The black-body source was kept at 2100 C and the dual-channel spectroradiometer was used to measure the spectrum, using circular variable filters with 4% resolution.

DESCRIPTORS: (U) \*INFRARED SPECTRA, \*ATMOSPHERIC PHYSICS, \*TRANSMITTANCE, LONG RANGE(DISTANCE), INFRARED FILTERS, INFRARED SPECTROMETERS, BLACKBODY RADIATION, SOURCES, COASTAL REGIONS, ISRAEL, OPTICS, PATHS, VARIABLES, FIELD TESTS, MEASUREMENT

MONITOR: AFOSR  
TR-85-0925

UNCLASSIFIED REPORT

ABSTRACT: (U) Experimental work has been directed primarily determining properties of metastable autodetaching negative ions, with a smaller effort directed to their production in beams, as well as the production and photodetachment of Li(-) beams. Properties of particular concern were the photodetachment cross sections, energy levels, and autodetachment lifetimes. Detailed studies have been made of resonant structures in the photodetachment of He(-) and Li(-) negative ions. Some previously reported metastable ions were found to be probably nonexistent, while others were given the first experimental proof, and one unpredicted species (He2(-)) was discovered. A long-lived auto-detaching form of OH(-) was also observed. Total neutralization cross sections were measured as functions of beam energy for Li(+) in Mg, Ca, Sr, and Ba, and cross sections were calculated for Li(+) + Ca. (Author)

DESCRIPTORS: (U) \*PHOTOCHEMICAL REACTIONS, ANIONS, LITHIUM, HELIUM, CROSS SECTIONS, ENERGY, FUNCTIONS, IONS, METASTABLE STATE, CHEMICAL DISSOCIATION, RESONANCE, STRUCTURES, ENERGY LEVELS, NEUTRALIZATION, PRODUCTION

AD-A181 258

AD-A181 256

UNCLASSIFIED

PAGE 190

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A161 258 CONTINUED

AD-A161 248 12/1

IDENTIFIERS: (U) WUAFOSR2301A7, PE61102F, LPN-SRI-PYU-4485

LOWELL UNIV MA CENTER FOR ATMOSPHERIC RESEARCH

(U) Research on the Inverse Problem of Scattering.

DESCRIPTIVE NOTE: Final rept. 1 Oct 83-30 Sep 84,

OCT 84 9P

PERSONAL AUTHORS: Moses, Harvey E. ;

CONTRACT NO. AFOSR-81-0253

PROJECT NO. 2304

TASK NO. A4

MONITOR: AFOSR  
TR-85-0935

UNCLASSIFIED REPORT

ABSTRACT: (U) Some progress was made in relating the inverse scattering problem to causality. In particular, Newton's 'Miracle' formula for the potential in three-dimensional inverse scattering was derived purely from causality considerations. Moreover, the one-dimensional analogue indicated some possible problems when point eigenvalues were present. Contents: Eigenvalues and Eigenfunctions Associated with the Gelfand-Levitan Equation, Phases of Complex Functions from the Amplitudes of the Functions and the Amplitudes of the Fourier and Mellin Transforms, and The Use of Comparison Filters in Linear Filter Theory.

DESCRIPTORS: (U) \*INVERSE SCATTERING, \*MATHEMATICAL FILTERS, FOURIER TRANSFORMATION, LINEAR FILTERING, EIGENVALUES, OPERATORS(MATHEMATICS), WAVE FUNCTIONS

IDENTIFIERS: (U) Gelfand levitan equation, Mellin transformation, Weiner hopf equation, Hilbert transformation, PE61102F, WUAFOSR2304A4

AD-A161 258

AD-A161 248

UNCLASSIFIED

PAGE 191

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A161 247 20/6 11/2

AD-A161 246 5/1 5/9

NATIONAL BUREAU OF STANDARDS GAITHERSBURG MD

SOUTHEASTERN CENTER FOR ELECTRICAL ENGINEERING EDUCATION  
INC ST CLOUD FL

(U) OM85. Basic Properties of Optical Materials Summaries  
of Papers.

(U) United States Air Force Weapons Laboratory Research  
Scholar Program, 1983-1984.

DESCRIPTIVE NOTE: Final rept. 7 May-1 Sep 85,

DESCRIPTIVE NOTE: Technical rept.,

MAY 85 88P

OCT 84 459P

PERSONAL AUTHORS: Feldman, Albert ;

PERSONAL AUTHORS: Peele, Warren D. ; Steele, Earl L. ;

REPORT NO. NBS-SP-697

CONTRACT NO. F49620-82-C-0035

PROJECT NO. 2308

TASK NO. 82

MONITOR: AFOSR

TR-85-0902

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The purpose of the conference is to bring together researchers from industry, academia, and government to discuss the physical and structural properties of optical materials as they affect optical performance. The scope of the conference includes the measurement and theory of basic properties in bulk and in thin film form and the dependence of these properties on atomic structure, morphological structure, impurity content, and inhomogeneity. Keywords: Glasses; Infrared; Modulated structures; Nonlinear optics; Metals; Organics; Optical constants; Optical waveguides; Photorefractive effect; Polymers; Semiconductors; Thin films.

DESCRIPTORS: (U) \*INFRARED OPTICAL MATERIALS, \*GLASS, \*OPTICAL WAVEGUIDES, METALS, THIN FILMS, SEMICONDUCTORS, POLYMERS, NONLINEAR SYSTEMS, ELECTROOPTICS, ELLIPSOIDMETERS, SPECTROPHOTOMETRY, CHALCOGENS

IDENTIFIERS: (U) Nonlinear optics, Second harmonic generation, Integrated optics, Quantum wells, Optical bistability, PE8102F, WUAFOSR230682

AD-A161 247

AD-A161 246

UNCLASSIFIED

PAGE 192

EVK551

ABSTRACT: (U) The AFWL Research Scholar Program was initiated as a pilot program to provide new research scholars with one year appointments at the Air Force Weapons Laboratory. Extensive mailings were made to technical departments at universities around the United States where programs of prime interest to the Weapons Laboratory are established. These include nuclear physics, radiation effects, electromagnetics, laser optics, and related applied sciences. Four scholars were appointed beginning in September 1983 and extending through September 1984, for 12 months duration. Several technical papers were presented by the scholars during the year. The final technical reports on the scholar's work are included in this report. Other information included: Application Information; Information Brochure for AFWL Research Scholars; Scholar Questionnaires and Responses; Program Statistics; List of 1983-84 AFWL Research Scholars; Scholars Statements of Goals & Objectives; Listing of Research Reports; Abstracts of AFWL Research Scholar Research Reports; and 1983-84 AFWL Research Scholar Final Reports.

DESCRIPTORS: (U) \*AIR FORCE RESEARCH, SCIENTISTS, INTERNS, RESEARCH MANAGEMENT

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A161 246 CONTINUED

AD-A161 229 7/4

IDENTIFIERS: (U) Scholars, PE81102F, WJAFOSR2301D5

MASSACHUSETTS INST OF TECH CAMBRIDGE DEPT OF CHEMISTRY

(U) State-Specific Rates of  $H_2CO(S_0)$  Yields  $H_2$  + at Energies Near the Top of Barrier: A Violation of RRKM Theory,

FEB 85 3P

PERSONAL AUTHORS: Dai, Hai-Lung ; Field, Robert W. ; Kinsey, James L. ;

CONTRACT NO. F49620-83-C-0010

PROJECT NO. 2303

TASK NO. 81

MONITOR: AFOSR  
TR-85-0887

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Chemical Physics, v82 p1606-1607 FEB 85.

ABSTRACT: (U) Unimolecular dissociation rates have been determined for two ro-vibrational eigenstates in the  $H_2CO$  X A1 electronic ground state. The two levels investigated are separated in energy by approx. 30/cm at a total energy near 28300/cm, which is near the top of the barrier for dissociation to  $H_2+CO$ . The angular momentum is J=2 for both levels and they have the same vibration-rotation symmetry. Contrary to the expectations from conventional RRKM theory, the state higher in energy has a dissociation rate approx. 2.5 times slower than the less energetic state. Originator supplied keywords include: Laser spectroscopy; Formaldehyde; Highly excited vibrational levels; Quantum ergodicity; Intramolecular vibrational redistribution.

DESCRIPTORS: (U) \*FORMALDEHYDE, \*HYDROGEN, \*MOLECULAR VIBRATION, \*CARBON MONOXIDE, MOLECULAR ENERGY LEVELS, CHEMICAL DISSOCIATION, RATES, REPRINTS

IDENTIFIERS: (U) \*Laser spectroscopy, PE81102F, WJAFOSR2303B1

AD-A161 246

AD-A161 229

UNCLASSIFIED

PAGE 193

EVK551

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

## SEARCH CONTROL NO. EVK551

AD-A161 228

7/3

STATE UNIV OF NEW YORK AT BUFFALO DEPT OF CHEMISTRY

(U) Charge Transport in Poly-(Ru(2,2'-Bipyridine)2(4-Vinylpyridine)2(3+/2) Films in AlCl3/N-(1-Butyl)Pyridinium Chloride and AlCl3/1-Methyl(3-Ethyl)Imidazolium Chloride Molten Salts.

85 15P

PERSONAL AUTHORS: Pickup, Peter G.; Osteryoung, Robert A.;

CONTRACT NO. AFOSR-84-0292

PROJECT NO. 2303

TASK NO. A1

MONITOR: AFOSR  
TR-85-0912

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Electroanal. Chem.  
v186 p99-111 1985.

ABSTRACT: (U) Charge transport in poly-(Ru(2,2'-bipyridine)2(3+/2+)) films have been measured by chronoamperometry, chronocoulometry, linear sweep voltammetry and mediated oxidation of (Fe(2,2'-bipyridine)3(2+)). Charge transport follows diffusional behavior in both acidic and neutral AlCl3/1-methyl(3-ethyl)imidazolium chloride molten salts and in CH3CN. The charge transport diffusion coefficient did not depend upon which melt was used and an average value of 0.00000017 mol/sq cm 1/2S was obtained. This is 2.6 times smaller than the value obtained in CH3CN. Possible reasons for this are discussed. Originator supplied keywords include: Ambient temperature molten salts; Electroactive polymers; Voltammetry kinetics.

DESCRIPTORS: (U) \*PYRIDINES, POLYMERS, TRANSPORT PROPERTIES, FILMS, CHLORIDES, ALUMINUM COMPOUNDS, SALTS, KINETICS, VOLTAMMETRY, REPRINTS

IDENTIFIERS: (U) PE61102F, WUAFOSR2303A1

AD-A161 228

## UNCLASSIFIED

AD-A161 228

PAGE 194

EVK551

AD-A161 226 7/4

PENNSYLVANIA STATE UNIV UNIVERSITY PARK DEPT OF CHEMISTRY

(U) Angle-Resolved Secondary Ion Mass Spectrometry.

DESCRIPTIVE NOTE: Technical rept.,

NOV 85 16P

PERSONAL AUTHORS: Winograd, Nicholas;

REPORT NO. TR-12

CONTRACT NO. N00014-83-K-0052, AFOSR-85-0028

MONITOR: AFOSR  
TR-85-1048

## UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in ACS Symposium Series no. 291,  
p83-96 1985.

ABSTRACT: (U) The interaction of keV particles with solids has been characterized by the measurement of the angle and energy distribution of sputtered secondary ions and neutrals. The results are compared to classical dynamics calculations of the ion impact event. Examples using secondary ions are given for clean Ni(001), Cu(001) reacted with O2, Ni(001) and Ni(7 9 11) reacted with CO, and Ag(111) reacted with benzene. The neutral Rh atoms desorbed from Rh(001) are characterized by multiphoton resonance ionization of these atoms after they have left the surface. (Author)

DESCRIPTORS: (U) \*MASS SPECTROMETRY, SPUTTERING, PARTICLE COLLISIONS, ANGLES, TARGETS, NICKEL, COPPER, SILVER, CRYSTAL STRUCTURE, REPRINTS, OXYGEN, CARBON MONOXIDE, BENZENE

IDENTIFIERS: (U) SIMS(Secondary Ion Mass Spectrometry), Ion Impact spectra, Secondary ions



## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A161 224

7/4

YALE UNIV NEW HAVEN CT DEPT OF CHEMICAL ENGINEERING

(U) Distribution of Internal Energy in CO and CO<sub>2</sub>  
Vibrationally Excited by a Hot Platinum Surface.

MAR 83

7P

PERSONAL AUTHORS: Mantell, D. A. ; Ryall, S. B. ; Haller, G. L.  
; Fenn, J. B. ;

CONTRACT NO. F49620-85-C-0065

PROJECT NO. 2303

TASK NO. AB1

MONITOR: AFOSR  
TR-85-0891

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: UB. IN Jnl. of Chemical Physics, v78  
n8 pt2 p4250-4255, 15 Mar 83.

ABSTRACT: (U) Changes in the internal state of CO and CO<sub>2</sub> molecules scattered by a hot platinum surface have been characterized by Fourier transform infrared emission spectroscopy. The only molecules which can be detected are those that are vibrationally excited for CO and excited to the asymmetric stretch mode for CO<sub>2</sub>. The distribution of rotational energy in these molecules is Boltzmann for CO<sub>2</sub> but not for CO. In both cases, the rotational energy is substantially less than the equilibration values based on the surface temperature. The accommodation coefficient for the asymmetric stretch vibrational mode of CO<sub>2</sub> drops from 0.22 at 700 K to 0.18 at 1500 K. Very few of the molecules which are vibrationally excited in the asymmetric stretch mode are also excited in either the bending or symmetric stretch mode. For CO, the vibrational accommodation coefficient is about 0.7. However, the fraction of the molecules excited to the v=2 vibrational level compared to the v=1 level indicates complete vibrational accommodation at the surface temperature. This implies a partitioning of CO molecules between those that completely accommodate vibrationally and those that do not accommodate at all. (Author)

AD-A161 224

AD-A161 224

UNCLASSIFIED

PAGE 195

EVK551

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A161 219

7/4

AD-A161 216 7/4 7/3 7/2

YALE UNIV NEW HAVEN CT DEPT OF CHEMICAL ENGINEERING

VANDERBILT UNIV NASHVILLE TN DEPT OF CHEMISTRY

(U) Vibrationally Excited CO<sub>2</sub> from the Reaction of O Atoms and Adsorbed CO on Platinum,

(U) Ab Initio Structures of Phosphorus Acids and Esters. 1. Phosphinic, Phosphonic and Phosphoric Acids,

SEP 84

8P

85 9P

PERSONAL AUTHORS: Kori, M.; Halpern, B. L. ;

PERSONAL AUTHORS: Ewig, Carl S.; van Wazer, John R. ;

CONTRACT NO. F49620-85-C-0065

CONTRACT NO. AFOSR-82-0100

PROJECT NO. 2303

PROJECT NO. 2303

TASK NO. B1

TASK NO. B2

MONITOR: AFOSR  
TR-85-0894MONITOR: AFOSR  
TR-85-0899

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Chemical Physics Letters, v110 n3 p223-229, 28 Sep 84.

SUPPLEMENTARY NOTE: Pub. in Jnl. of American Chemical Society, v107 n7 p1985-1971 1985.

ABSTRACT: (U) Highly excited CO<sub>2</sub> is produced by the reaction O + CO sub ads over platinum yields CO\*. Its infrared emission spectrum indicates that more than half of the 4.1 eV exoergicity appears in asymmetric stretch vibration in a distribution peaked roughly at level (009). CO<sub>2</sub>\* is destroyed by O atoms at high pressure rho approx. = 10 mTorr). The reaction dynamics and applications are discussed.

ABSTRACT: (U) The molecular structures of all stable conformations of phosphinic, phosphonic, and phosphoric acid have been computed by employing complete geometry optimization in a variety of basis sets. Phosphinic acid, the species with the fewest torsional degrees of freedom, was examined in detail to determine the origin of forces giving rise to its preferred conformation. These forces are due almost entirely to electrostatic effects such as dipole-dipole interactions, with stereoelectronic anomeric and steric effects each being at most 12% as large. Bond lengths and angles generally agree with the limited prior theoretical and experimental values. In each acid one or more additional higher energy stable conformations are found in the STO basis set, but these usually do not appear when larger basis sets are employed. All three acids exhibit a minimum-energy conformation in which the acidic hydrogens are oriented toward the phosphoryl oxygen and a distance from it, typically 2.7-2.8 A, which is nearly the same in each case. The conformations of all three acids may be described solely on the basis of dipole-dipole interactions plus relatively small internal hydrogen bonding and steric effects. In contrast to earlier studies little conformational evidence of anomeric effects is found in any of these compounds. (Author)

DESCRIPTORS: (U) \*REACTION KINETICS, \*ADSORPTION, CARBON MONOXIDE, CARBON DIOXIDE, OXYGEN, MOLECULAR VIBRATION, EMISSION SPECTRA, EXCITATION, CATALYSIS, PLATINUM, REPRINTS

IDENTIFIERS: (U) PE62201F, WJAFOSR230381

AD-A161 219

AD-A161 216

UNCLASSIFIED

PAGE 196

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A161 216 CONTINUED

AD-A161 182 7/4 20/10

DESCRIPTORS: (U) \*MOLECULAR STRUCTURE, \*PHOSPHONIC ACIDS, \*PHOSPHORIC ACIDS, ENTHALPY, HEAT OF REACTION, DIPOLES, INTERACTIONS, HYDROGEN BONDS, STEREOCHEMISTRY, REPRINTS

PITTSBURGH UNIV PA DEPT OF PHYSICS AND ASTRONOMY

(U) Possibility of Observing Quantum Size Effects in the Electromagnetic Absorption Spectrum of Small Metal Particles,

IDENTIFIERS: (U) Dipole dipole interactions, PEB1102F, WJAFOSR230382

AUG 85 4P

PERSONAL AUTHORS: Devaty, R. P. ; Sievers, A. J. ;

CONTRACT NO. AFOSR-81-0121, NSF-DNR81-08087

PROJECT NO. 2308

TASK NO. 82

MONITOR: AFOSR  
TR-85-0932

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Physical Review B, v32 n4  
p1951-1954, 15 Aug 85.

ABSTRACT: (U) The possibility of observing quantum size effects in very small metal particles by absorption spectroscopy is reexamined. According to the Gor'kov-Eliashberg theory, nonquadratic frequency dependence of the absorption coefficient persists at sufficiently low frequencies even when there is a size distribution.

DESCRIPTORS: (U) \*ABSORPTION SPECTRA, \*QUANTUM THEORY, PARTICULATES, METALS, ABSORPTION COEFFICIENTS, PARTICLE SIZE, DISTRIBUTION FUNCTIONS, REPRINTS

IDENTIFIERS: (U) Gorkov Eliashberg theory, QSE(Quantum Size Effect)

AD-A161 216

AD-A161 182

UNCLASSIFIED

PAGE 197

EVK551

## UNCLASSIFIED

## DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A161 169

7/4

AD-A161 168

7/4

STATE UNIV OF NEW YORK AT BUFFALO DEPT OF CHEMISTRY

STATE UNIV OF NEW YORK AT BUFFALO DEPT OF CHEMISTRY

(U) On Ionic Association in Ambient Temperature Chloroaluminate Molten Salts. Analysis of Electrochemical and Conductance Data.

(U) Electrochemical Oxidation of Some Metal Carbonyls in Ambient Temperature Ionic Liquids.

MAY 85

7P

85 6P

PERSONAL AUTHORS: Lipsztajn, Marek ; Osteryoung, Robert A. ;

PERSONAL AUTHORS: Sahami, Saeed ; Osteryoung, Robert A. ;

CONTRACT NO. AFOSR-84-0292

CONTRACT NO. AFOSR-84-0292

MONITOR: AFOSR  
TR-85-0808

PROJECT NO. 2303

TASK NO. A1

UNCLASSIFIED REPORT

MONITOR: AFOSR  
TR-85-0909

SUPPLEMENTARY NOTE: Pub. in Jnl. of the Electrochemical Society, v132 n5 p1126-1130 May 85.

UNCLASSIFIED REPORT

ABSTRACT: (U) A simple model based on the validity of the Nernst-Einstein equation and a constant  $u$  sub 1 eta product was applied to the interpretation of conductance data for  $AlCl_3-RC1$  ( $R = N-(1-butyl)pyridinium$  or 1-methyl-3-ethylimidazolium) ambient temperature ionic liquids. The dissociation constants of  $AlCl_3$  and  $Al_2Cl_7$  were calculated, and the experimental values of specific conductivity were reproduced with an error not exceeding 5% from ionic mobilities calculated, from electrochemically measured diffusion coefficients. This calculation suggests that about 50% of the ions are associated into ion pairs. For very basic melts ( $MC < or = 0.8$ ), the formation of ion aggregates is postulated. (Author)

SUPPLEMENTARY NOTE: Pub. in Electrochimica Acta, v30 n1 p143-146 1985.

UNCLASSIFIED REPORT

ABSTRACT: (U) The electrochemical oxidation of  $Cr(CO)_6$ ,  $W(CO)_6$  and  $Fe(CO)_5$  was studied in the  $AlCl_3:N(1-butyl)pyridinium$  chloride ( $BuPyCl$ ) molten salt at 40 C. In the 1:1 to 2:1 mole ratio of  $AlCl_3/BuPyCl$ ,  $Cr(CO)_6$  was found to be reversibly oxidized forming stable  $Cr(CO)_8$ . Further oxidation of  $Cr(CO)_6$  generated  $Cr(CO)_8^{3+}$  which was not stable. Iron pentacarbonyl and tungsten hexacarbonyl in 1:1 to 2:1 melts each showed a single oxidation with some stability of their cations.  $Fe(CO)_5$  + was more stable than  $W(CO)_6(2+)$ . In the melt of <1:1 mole ratio no evidence was found for the formation of stable  $Fe(CO)_5^{+}$ .

DESCRIPTORS: (U) \*ELECTROCHEMISTRY, \*ELECTRICAL CONDUCTIVITY, \*FUSED SALTS, ELECTROLYTES, ALUMINUM COMPOUNDS, CHLORIDES, ION ION INTERACTIONS, TRANSPORT PROPERTIES, EQUATIONS, COMPUTATIONS, REPRINTS

DESCRIPTORS: (U) \*ELECTROCHEMISTRY, \*OXIDATION, \*CARBONYL COMPOUNDS, \*FUSED SALTS, ALUMINUM COMPOUNDS, CHLORIDES, STABILITY, CHROMIUM, TUNGSTEN, IRON, CATIONS, VOLTAMMETRY, REPRINTS

IDENTIFIERS: (U) Nernst Einstein equations, PE61102F

IDENTIFIERS: (U) WJAFOSR2303A1, PE61102F

AD-A161 169

AD-A161 168

## UNCLASSIFIED

PAGE 198

EVK551

## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A181 167 7/4 20/10

CALIFORNIA INST OF TECH PASADENA ARTHUR AMOS NOYES LAB  
OF CHEMICAL PHYSICS(U) Quantum Mechanical Partitioning of Kinetic Energy in  
Collision-Induced Dissociation.

MAR 85 5P

PERSONAL AUTHORS: Kaye, Jack A. ; Kuppermann, Aron ;

REPORT NO. CONTRIB-7010

CONTRACT NO. F49620-79-C-0187, AFOSR-82-0341

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-85-0885

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Chemical Physics Letters,  
v115 n2 p158-163, 29 Mar 85.ABSTRACT: (U) Kinetic energy distributions of atomic  
products of the collision-induced dissociation A+BC  
yields A+B+C on a model triatomic reactive collinear  
system have been obtained for the first time by an  
accurate quantum mechanical method and compared with the  
results of quasi-classical trajectory calculations.DESCRIPTORS: (U) \*DISSOCIATION, \*QUANTUM THEORY,  
SCATTERING, PARTICLE COLLISIONS, MOLECULAR STATES,  
SCATTERING, REPRINTSIDENTIFIERS: (U) Partition functions, Collision induced  
dissociation, PEB1102F, WUAFOSR2303B1

AD-A181 167

UNCLASSIFIED

PAGE 199

EVK551

AD-A181 166 7/4

YALE UNIV NEW HAVEN CT DEPT OF CHEMICAL ENGINEERING

(U) Time-Resolved Infrared Emission Studies of CO(2)  
Formed by CO Oxidation on Pt and Pd.

NOV 83 5P

PERSONAL AUTHORS: Mantell, David A. ; Ryall, Subbarao B. ;  
Haller, Gary L. ;

CONTRACT NO. F49620-85-C-0085, F49620-80-C-0026

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-85-0896

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Chemical Physics Letters,  
v102 n1 p37-40, 11 Nov 83.ABSTRACT: (U) It is clear from measurements of the  
activation energy for CO oxidation on Pt that the barrier  
for CO<sub>2</sub> activated complex is a strong function of  
coverage, i.e. it is approx. 24 kcal/mol at low coverage  
and decreases to 12 kcal/mol at high coverage. Thus, it  
is perhaps not surprising that we have found that CO<sub>2</sub>  
desorbing from the activated complex formed at different  
degrees of coverage (by chemisorbed CO and O atoms)  
partitions energy among translation and internal states  
differently. The method of changing the coverage in these  
experiments was to change the surface temperature. The  
time resolution capabilities of a Fourier-transform  
infrared spectrometer are used in conjunction with a  
pulsed nozzle to study the effects of CO and O coverage  
on the product CO<sub>2</sub> energy distributions from the  
oxidation of CO and Pt and Pd surfaces. No coverage  
effect is found on Pd but on Pt a large reduction in the  
internal energy is observed as the oxygen on the surface  
is depleted.DESCRIPTORS: (U) \*INFRARED SPECTROSCOPY, \*FOURIER  
SPECTROSCOPY, \*CARBON DIOXIDE, SURFACE CHEMISTRY,  
OXIDATION, CARBON MONOXIDE, PLATINUM, PALLADIUM, OXYGEN,  
CHEMISORPTION, NOZZLE GAS FLOW, REPRINTS

AD-A181 168

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A161 166 CONTINUED

AD-A161 151 10/2 9/1

STATE UNIV OF NEW YORK AT BUFFALO DEPT OF CHEMISTRY

IDENTIFIERS: (U) WUAFOSR2303B1, PE81102F

(U) Organic-Thin-Film-Coated Solar Cells: Energy Transfer between Surface Pyrene Molecules and the Silicon Semiconductor Substrate,

84 10P

PERSONAL AUTHORS: McCaffrey, Robert R. ; Prasad, Paras N. ;

CONTRACT NO. AFOSR-82-0118

PROJECT NO. 2303

TASK NO. A3

MONITOR: AFOSR  
TR-85-0920

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Solar Cells, v11 p401-409  
1984.

ABSTRACT: (U) The energy transfer processes in a pyrene thin film, deposited onto a silicon solar cell, are investigated. An increase in the solar cell efficiency is observed for cells coated with a pyrene thin film. The increase in efficiency is attributed to a combination of two effects: (i) the antireflective properties of the pyrene film and (ii) direct energy transfer from pyrene to silicon. A comparison of emission, photoexcitation and spectral response data reveals the nature of the pyrene energy transfer to be radiative.

DESCRIPTORS: (U) \*THIN FILMS, \*SOLAR CELLS, HYDROCARBONS, ENERGY TRANSFER, SILICON, SEMICONDUCTORS, SUBSTRATES, EFFICIENCY, ANTIREFLECTION COATINGS, REPRINTS

IDENTIFIERS: (U) Pyrene, PE81102F, WUAFOSR2303A3

AD-A161 166

AD-A161 151

UNCLASSIFIED

PAGE 200

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A161 146

12/1

AD-A161 140 7/4 20/1

WISCONSIN UNIV-MADISON DEPT OF COMPUTER SCIENCES

STATE UNIV OF NEW YORK AT BUFFALO DEPT OF CHEMISTRY

(U) On the Distribution of the Singular Values of Toeplitz Matrices.

(U) Nonlinear Electroacoustic Phenomena: Phonon Echo in d-Tartaric Acid and Its Salts.

DESCRIPTIVE NOTE: Technical rept.,

84 5P

AUG 85 21P

PERSONAL AUTHORS: Swiatkiewicz, Jacek ; Prasad, Paras N. ;

REPORT NO. WIS-CS-TR-809

CONTRACT NO. AFOSR-82-0118

PROJECT NO. 2304

PROJECT NO. 2303

CONTRACT NO. AFOSR-82-0275

TASK NO. A3

MONITOR: AFOSR

MONITOR: AFOSR  
TR-85-0921

TASK NO. A3

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Physical Chemistry,  
V88 n24 p5899-5902 1984.

ABSTRACT: (U) This document proves an interlacing theorem for singular values which is applied to obtain extension of the Szego theorem to the singular values of  $T \text{ sub } n(f)$  when  $f$  is not a real-valued function. The asymptotic distribution of the singular values of Toeplitz matrices can be expressed in the terminology of the theory of equal distribution. Keywords: Moler's problem.

DESCRIPTORS: (U) \*MATRICES(MATHEMATICS), \*DISTRIBUTION FUNCTIONS, VALUE, EIGENVALUES, ESTIMATES, THEOREMS, PERIODIC FUNCTIONS, POLYNOMIALS

IDENTIFIERS: (U) \*Toeplitz matrices, Hermitian matrices, Moler's problem, PEB1102F, WUAFOSR2304A3

ABSTRACT: (U) The phonon echo, also called polarization or electroacoustic echo, is investigated for d-tartaric acid and its diammonium salt as well as for the Rochelle salt by using the two-pulse technique. The dependence of the echo amplitude on the delay time is described by both the anharmonic oscillator model and the model of coupled micromotions of the grains recently proposed by Pouget and Maugin. The echo under the experimental conditions behaves according to the small signal limit. The dependence of the damping factor on the pressure of the surrounding gas and the temperature is used respectively to measure an average speed of sound and to derive the mechanism of damping. Under vacuum, the damping factor is found to depend on the square of the radio frequency ( $\omega$ ) as is expected from an intrinsic loss mechanism. A plot of the temperature dependence of the damping factor for d-tartaric acid exhibits a maximum. This maximum is explained by a thermally activated acoustic relaxation within the powder particles. The observed deuteration effect both on the shape and the position of the maximum points out the importance of hydrogen motions for the acoustic relaxation in these hydrogen-bonded solids.

DESCRIPTORS: (U) \*SUCCINIC ACID, \*HYDROXYL RADICALS, \*SALTS, \*ELECTROACOUSTICS, AMMONIUM COMPOUNDS, PHONONS.

AD-A161 146

AD-A161 140

UNCLASSIFIED

PAGE 201

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A181 140 CONTINUED

AD-A161 138 4/2

ECHOES, POLARIZATION, AMPLITUDE, DAMPING, POWDERS,  
HYDROGEN BONDS, REPRINTS

COLORADO STATE UNIV FORT COLLINS DEPT OF ATMOSPHERIC  
SCIENCE

IDENTIFIERS: (U) \*Tartaric acid, Electroacoustic echoes,  
Phonon echoes. WUAFOSR2303A3, PEB1102F

(U) Effects of Mountain Ranges on Mesoscale Systems  
Development.

DESCRIPTIVE NOTE: Final rept. 15 Apr 82-31 Jul 85,

SEP 85 191P

PERSONAL AUTHORS: Reiter, Elmar R.; Sheaffer, John D.;  
Klitich, Marjorie A.; McAnelly, Ray L.;

CONTRACT NO. AFOSR-82-0182

PROJECT NO. 2310

TASK NO. A1

MONITOR: AFOSR  
TR-85-0924

UNCLASSIFIED REPORT

ABSTRACT: (U) Synoptic studies addressed themselves to a moisture bridge over Central America which often is tied to severe weather in the Rocky Mountain area. Heavy flooding events over eastern China have been tied to preferred positions of blocking highs and to vortices developing over the Plateau of Tibet. Mesoscale convective systems over, and to the east of, the U.S. Rocky Mountains have been investigated by individual case studies as well as by satellite composite imagery. There appears to be a well-defined sequence of events, whereby first the average precipitation rate maximizes, then the volumetric rain rate, and finally the rain area. Appendices: A Satellite Climatology of Intense Convective Storms from Manually Digitized Hourly Cloud Cover Fields; Meso-beta-scale Characteristics of the Meso-alpha-scale Convective Complex; Evolution of Precipitation and Upper Air Characteristics During the Life-Cycle of a Composite Mesoscale Convective Complex; The Precipitation Life Cycle of Mesoscale Convective Complexes.

DESCRIPTORS: (U) \*CONVECTION(ATMOSPHERIC), \*ATMOSPHERIC PRECIPITATION, MOUNTAINS, COLORADO, CHINA, STORMS, LIFE CYCLES, CLOUD COVER, REPRINTS

AD-A181 140

AD-A161 138

UNCLASSIFIED

PAGE 202

EVK551



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A161 136 CONTINUED

AD-A161 132 7/4 20/5

IDENTIFIERS: (U) Rocky Mountains, Mesoscale, Tibet,  
WUAFOSR2310A1, PE81102F

ROCHESTER UNIV NY DEPT OF CHEMISTRY

(U) Theoretical Studies of Laser-Induced Molecular Rate  
Processes: Topics in Line Broadening and Spectroscopy.

DESCRIPTIVE NOTE: Final rept. 15 Nov 81-30 Sep 85.

OCT 85 20P

PERSONAL AUTHORS: George, Thomas F. ;

CONTRACT NO. AFOSR-82-0046

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR  
TR-85-0929

UNCLASSIFIED REPORT

ABSTRACT: (U) Theoretical studies of molecular rate processes were carried out, with an emphasis on how such processes can be induced or affected by external laser radiation. The processes were classified into two types: Gas-Phase Processes and Surface Processes. Within the first type a variety of laser-assisted collisional processes were investigated, including chemical reactions in a laser field, laser-induced resonance scattering with applications to transition-state spectroscopy and line broadening in general, laser-induced curve switching, isotope separation by selective radiative scattering and laser-induced associative ionization. Several related problems not necessarily involving a laser field were investigated, such as fine-structure transitions in alkali-noble-gas collisions and nonlocal potentials in bound-continuum problems. In regard to the second-type of processes, the following dynamical processes were considered: electron transfer in positive-ion-surface collisions, where one-electron transfer leads to ion neutralization and two-electron transfer leads to negative-ion formation (the latter necessitates the inclusion of the Anderson correlation energy); surface-state excitation and laser-enhanced ion-semiconductor electron transfer; laser-induced electron-phonon processes on metal surfaces; formation of electron-hole pairs in a semiconductor by vibrationally-excited

AD-A161 138

AD-A161 132

UNCLASSIFIED

PAGE 203

EVK551

## UNCLASSIFIED

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SEARCH CONTROL NO. EVK551

AD-A161 132 CONTINUED

AD-A161 131 7/4 20/12 9/1

molecules; vibrational (both energy and phase) relaxation of a laser-excited adspecies; and laser-induced migration. Spectroscopic processes included resonance fluorescence of atoms near a metal surface and Stark quantum beats from beam-foil excited hydrogen atoms.

DESCRIPTORS: (U) \*MOLECULAR SPECTROSCOPY, \*RADIATION ABSORPTION, \*ELECTRON TRANSITIONS, LASER BEAMS, LASER APPLICATIONS, EXCITATION, RESONANCE RADIATION, RESONANCE SCATTERING, PARTICLE COLLISIONS, COLLISION BROADENING, ISOTOPE SEPARATION, ELECTRON TRANSFER, HYDROGEN FLUORIDE LASERS, SURFACE PROPERTIES, SEMICONDUCTORS, PHONONS, MOLECULAR VIBRATION, LASER INDUCED FLUORESCENCE

IDENTIFIERS: (U) WUAFOSR230383, PE81102F

UNIVERSITY COLL CORK (IRELAND) DEPT OF CHEMISTRY

(U) Re-Evaluation of Surface Properties of Oxide-Cathode Materials.

DESCRIPTIVE NOTE: Final rept. 1 Jul 84-28 Feb 85,

JUL 85 79P

PERSONAL AUTHORS: Cunningham, Joseph ;

CONTRACT NO. AFOSR-84-0129

PROJECT NO. 2301

TASK NO. D1

MONITOR: AFOSR  
TR-85-0933

UNCLASSIFIED REPORT

ABSTRACT: (U) Surface properties of high-surface-area samples of alkaline earth oxides BaO, MgO, SrO, and CaO prepared singly as pure materials or as binary systems having BaO dispersed onto the surface of another of the oxides - have been examined using as probes the luminescence and the catalytic activity of the materials. Comparisons of results from the pure systems with those from the binary systems are consistent with extensive reconstruction (rumpling) of the surface layers of the surface-doped binary systems. Such rumpling can produce up to one half of a mono-layer of surface ions jutting out from the surface with a high degree of coordinative unsaturation and resultant high lability and catalytic activity.

DESCRIPTORS: (U) \*ALKALINE EARTH OXIDES, \*CATHODES, \*DOPING, \*SURFACE CHEMISTRY, SURFACE PROPERTIES, LUMINESCENCE, CATALYSIS, BINARY COMPOUNDS, IONS, BARIUM OXIDES, MAGNESIUM OXIDES, CALCIUM OXIDES, STRONTIUM

IDENTIFIERS: (U) WUAFOSR2301D1, PE81102F

AD-A161 132

AD-A161 131

UNCLASSIFIED

PAGE 204

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A161 130 12/1

AD-A161 123 7/4 7/5 20/10

MASSACHUSETTS INST OF TECH CAMBRIDGE ARTIFICIAL INTELLIGENCE LAB

STATE UNIV OF NEW YORK AT BUFFALO AMHERST

(U) Probabilistic Solution of Inverse Problems.

(U) Spontaneous Emission by Two Atoms with Different Resonance Frequencies near Metal Surface.

DESCRIPTIVE NOTE: Doctoral thesis.

SEP 85 13P

SEP 85 203P

PERSONAL AUTHORS: Lam, Kai S. ; George, Thomas F. ;

REPORT NO. AI-TR-880, LIDS-TH-1500

REPORT NO. 88

CONTRACT NO. N00014-80-C-0505, AFOSR-82-0258

CONTRACT NO. AFOSR-82-0048

MONITOR: AFOSR  
TR-85-1128

PROJECT NO. 2303

TASK NO. B3

MONITOR: AFOSR  
TR-85-0927

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Supported in part by Contracts DAAG29-84-K-0005 and AFOSR-82-0135.

SUPPLEMENTARY NOTE: Pub. in Physical Review B, v32 n6 p3622-3633, 15 Sep 85.

ABSTRACT: (U) In this thesis we study the general problem of reconstructing a function, defined on a finite lattice, from a set of incomplete, noisy and/or ambiguous observations. The goal of this work is to demonstrate the generality and practical value of a probabilistic (in particular, Bayesian) approach to this problem, particularly in the context of Computer Vision. In this approach, the prior knowledge about the solution is expressed in the form of a Gaussian probability distribution on the space of all possible functions, so that the reconstruction task is formulated as an estimation problem. Keywords: Inverse problems; Computer vision; Surface interpolation; Image restoration; Markov random fields; Optimal estimation; Simulated annealing.

ABSTRACT: (U) The interaction between electromagnetic radiation and two two-level atoms with different resonance frequencies near a perfectly conducting metal surface is considered. The atom-atom and atom-surface separations are assumed to be smaller than the corresponding mean resonance wavelength. A quantum-mechanical version of the image method is adopted to study the spontaneous emission by such an atomic pair. Within the framework of this approach, each individual atom and its corresponding image are kinematically correlated, while dynamically they are in effect independent. The total radiation rate of the atomic system is calculated as a function of time for various values of frequency difference. Explicit results are given for several different initial states of the atomic system. Some of them exhibit superradiance, and some initially act as photon-trapping states and eventually are able to undergo radiative decay. Oscillations as a manifestation of beating appear in the time evolution of the radiation rate in all cases of the various initial states, when the frequency difference becomes larger than a critical value given as twice the mean halfwidth of the atomic resonance lines.

DESCRIPTORS: (U) \*PROBLEM SOLVING, \*INVERSION, \*PROBABILITY DISTRIBUTION FUNCTIONS, COMPUTERS, VISION, ESTIMATES, OPTIMIZATION, INTERPOLATION, SURFACES, IMAGE RESTORATION, MARKOV PROCESSES, PROBABILITY, SOLUTIONS(GENERAL), ANNEALING, SIMULATION, THESES

IDENTIFIERS: (U) Computer vision

AD-A161 130

AD-A161 123

UNCLASSIFIED

PAGE 205

EVK551

## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A161 123 CONTINUED

AD-A161 122 7/3

ULTRASYSTEMS INC IRVINE CA

DESCRIPTORS: (U) \*ATOMIC PROPERTIES, \*EMISSION SPECTRA,  
ELECTROMAGNETIC RADIATION, SURFACE REACTIONS,  
PHOTOCHEMICAL REACTIONS, METALS, RESONANCE, QUANTUM  
THEORY, REPRINTS

(U) Phospha-S-Triazines. VIII. Chloro-Substituted  
Diphospha-S-Triazines.

85 13P

IDENTIFIERS: (U) WJAFOSR230383, PE81102F

PERSONAL AUTHORS: Paciorek, K. J. L.; Harris, D. H.; Smythe,  
M. E.; Nakahara, J. H.; Kratzer, R. H.;

CONTRACT NO. F49820-82-C-0021

PROJECT NO. 2303

TASK NO. B2

MONITOR: AFOSR  
TR-85-0844

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Jnl. of Fluorine Chemistry,  
v28 p387-398 1985.

ABSTRACT: (U) 1,3-Bis(phenylchlorophospha)-5-perfluoroalkyl-2,4,6-triazine and the corresponding perfluoroalkylether analogue were synthesized by interaction of equimolar amounts of the respective amidines and imido-diphenyl-diphosphinic acid pentachloride. With additional quantities of amidine, 1,3-bis(phenylperfluoro-n-octanoylamidophospha)-5-perfluoro-n-heptyl-2,4,6-triazine was obtained. The replacement of the chloro- by azido-groups in 1,3-bis(phenylchlorophospha)-5-perfluoro-n-heptyl-2,4,6-triazine proceeded readily. The mass spectral breakdown patterns of the chloro- and the amidino-substituted compounds were directly comparable to those of the bis(diphenylphospha)-s-triazines.

DESCRIPTORS: (U) \*SYNTHESIS(CHEMISTRY), \*TRIAZINES,  
\*ORGANIC PHOSPHORUS COMPOUNDS, CHLORINE, FLUORINE, ALKYL  
RADICALS, SUBSTITUTION REACTIONS, MASS SPECTROSCOPY,  
REPRINTS

IDENTIFIERS: (U) WJAFOSR230382, PE81102F

AD-A161 123

AD-A161 122

UNCLASSIFIED

PAGE 208

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A161 115 7/4 8/15 7/3

AD-A161 114 12/1

STATE UNIV OF NEW YORK AT BUFFALO DEPT OF CHEMISTRY

BROWN UNIV PROVIDENCE RI LEFSCHETZ CENTER FOR DYNAMICAL SYSTEMS

(U) Laser Raman Investigation of Drug-Polymer Conjugates: Sulfathiazole-Povidone Coprecipitates,

(U) On a Variational Approach to Some Parameter Estimation Problems.

DEC 84 4P

DESCRIPTIVE NOTE: Interim rept.,

PERSONAL AUTHORS: Bolton, Barbara A. ; Prasad, Paras N. ;

MAY 85 82P

CONTRACT NO. AFOSR-82-0118

PERSONAL AUTHORS: Barks, H. T. ;

PROJECT NO. 2303

REPORT NO. LCDS-TR-85-14

TASK NO. A3

CONTRACT NO. DAAG28-83-K-0029, AFOSR-84-0398

MONITOR: AFOSR  
TR-85-0919

PROJECT NO. 2304

UNCLASSIFIED REPORT

TASK NO. A1

MONITOR: AFOSR  
TR-85-0938

SUPPLEMENTARY NOTE: Pub. in Jnl. of Pharmaceutical Sciences, v73 n12 p1849-1851 Dec 84.

UNCLASSIFIED REPORT

ABSTRACT: (U) Laser Raman spectroscopy is used for the investigation of the drug-polymer conjugates, sulfathiazole-povidone. Specifically, Raman spectra, both in the lattice vibration and the intramolecular vibration regions, are used to characterize various polymorphic forms of sulfathiazole. It is found that sulfathiazole exists in two unsolvated forms, untreated sulfathiazole and another form grown from propanol. The crystals grown from ethanol include varying amounts of ethanol depending on the growth condition. The nature of the povidone-sulfathiazole coprecipitates of various compositions are studied. We find no evidence of any new polymorphic form of sulfathiazole in these coprecipitates. The coprecipitates are found to consist of one of the unsolvated forms of sulfathiazole.

DESCRIPTORS: (U) \*RAMAN SPECTROSCOPY, \*DRUGS, \*POLYMERS, COUPLING(INTERACTION), VIBRATION, PRECIPITATES, CRYSTAL LATTICES, DISSOLVING, REPRINTS

IDENTIFIERS: (U) \*Sulfathiazole, \*Povidone

AD-A161 115

AD-A161 114

UNCLASSIFIED

PAGE 207

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A161 099 11/8 20/12

AD-A161 099 CONTINUED

WASHINGTON UNIV ST LOUIS MO SEMICONDUCTOR RESEARCH LAB

(U) Clustering and Ordering in III-V Alloys.

DESCRIPTIVE NOTE: Annual scientific rept. 1 Jun 84-31 May 85,

JUL 85 137P

PERSONAL AUTHORS: Wolfe, C. M.; Muller, M. W.; Hsieh, S. J.; Patten, Elizabeth A.; Robin, P.;

REPORT NO. WU/SRL-59583A-9

CONTRACT NO. AFOSR-82-0231

PROJECT NO. 2306

TASK NO. 81

MONITOR: AFOSR  
TR-85-0931

# UNCLASSIFIED REPORT

ABSTRACT: (U) Staggered lineup heterojunctions are expected to exhibit tunneling assisted optical transitions across the interfacial energy gap E sub I. In the staggered lineup, E sub I is smaller than either of the energy gaps of the constituent semiconductors. In this work, we examined two staggered lineup heterojunctions, ZnSnP2/GaAs and In1-xGaP/GaAs. Below bandgap emission and absorption were observed in these structures, allowing the experimental determination of E sub I. Good agreement was seen between this value of E sub I and that from the predicted band lineup. Advances in technology have made possible the fabrication of rapidly varying heterostructures which hold the promise of important applications. We develop a set of approximate treatments of electron states in a variety of layered heterostructures. Recent III-V alloy formation models indicate that negative charge transfer energy can overcome positive bond distortion energy to stabilize long-range order or compound formation. Although a report of a layered ordering in AlxGa1-xAs tends to confirm this result, we have as yet obtained no convincing evidence for such ordering in InxGa1-xP.

AD-A161 099

AD-A161 099

UNCLASSIFIED

PAGE 208

EVK551

IDENTIFIERS: (U) WUAFOSR2308B1, PE61102F

DESCRIPTORS: (U) \*ALLOYS, \*GROUP III COMPOUNDS, \*GROUP V COMPOUNDS, \*SEMICONDUCTORS, CLUSTERING, HETEROJUNCTIONS, COMPOSITION (PROPERTY), CRYSTAL STRUCTURE, TERNARY COMPOUNDS, CLUSTERING, ENERGY GAPS, INTERFACES, ELECTRONIC STATES, APPROXIMATION (MATHEMATICS), ZINC, TIN, PHOSPHIDES, INDIUM, GALLIUM PHOSPHIDES, ALUMINUM, GALLIUM ARSENIIDES

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A161 096

12/1

AD-A161 095

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7/4

WISCONSIN UNIV-MADISON DEPT OF COMPUTER SCIENCES

STATE UNIV OF NEW YORK AT BUFFALO DEPT OF CHEMISTRY

(U) On an Estimate for the Three-Grid MGR Multigrid Method.

(U) Molecular Mechanics of Polymeric Interactions.

DESCRIPTIVE NOTE: Technical rept.,

DESCRIPTIVE NOTE: Final rept. 15 Feb 82-14 Feb 85.

AUG 85

40P

FEB 85

9P

PERSONAL AUTHORS: Parter, Seymour V. ;

PERSONAL AUTHORS: Prasad, Paras N. ;

REPORT NO. TR-810

CONTRACT NO. AFOSR-82-0118

CONTRACT NO. AFOSR-82-0275

PROJECT NO. 2303

PROJECT NO. 2304

TASK NO. A3

TASK NO. A3

MONITOR: AFOSR

TR-85-0917

MONITOR: AFOSR

TR-85-0940

UNCLASSIFIED REPORT

UNCLASSIFIED REPORT

ABSTRACT: (U) The MGR(upsilon) multigrid algorithm of Ries, Trottenberg and Winter, Algorithm 2.1 of Braess and Algorithm 4.1 of Verfurth are all algorithms for the numerical solution of the discrete Poisson equation based on red-black Gauss-Seidel smoothing iterations. This work considers the extension of the MGR(0) method to a certain general diffusion equation. In particular, for the three grid scheme the author extends an interesting and important result of Ries, Trottenberg and Winter whose results are based on Fourier analysis and hence intrinsically limited to the case where omega is a rectangle. Let omega be a general polygonal domain whose sides have slope + or - 1.0 and infinity. Keywords: Iterations; Eigenvalues; Operators(Mathematics).

DESCRIPTORS: (U) \*ALGORITHMS, \*SOLUTIONS(GENERAL), \*EQUATIONS, ESTIMATES, POISSON EQUATION, FOURIER ANALYSIS, ITERATIONS, POLYGONS, OPERATORS(MATHEMATICS), EIGENVALUES

IDENTIFIERS: (U) \*Multigrid algorithm, Diffusion equations

AD-A161 096

AD-A161 095

UNCLASSIFIED

PAGE 209

EVK551

ABSTRACT: (U) Three interfacial methods have been used to produce thin polymeric films. These are reactions at solid-gas interface, Langmuir-Blodgett, and electrochemical polymerization. The reaction at solid-gas interface involved the use of a thin monomeric film, vacuum deposited, which was subsequently exposed to a strong Lewis acid such as AsF5 in a controlled atmosphere. Two new polymers were produced: polyfuryl and polyazulene. Coherent thin films of poly bis(p-toluene sulfonate) diacetylene were successfully formed by modified Langmuir-Blodgett techniques using two methods: photopolymerization of the monomer film at the gas/liquid interface and then transfer to a solid substrate; and transfer of the monomer film to the solid substrate and subsequent photopolymerization on the substrate itself. The area of polymerization of the electrode/solution interface in an electrochemical cell is highly active because of the prospect to produce high quality electroactive polymers of controlled ultrasubmicron thickness. Polyazulene was formed by anodic polymerization of azulene. Chemical doping will increase the electrical conductivities of several polymers as well as induce conformational changes in some polymers. The nature of the iodine-nylon 6 complex was by resonance Raman spectroscopy. This work revealed the presence of both I3 minus and I5 minus species. The non-linear electroacoustic effect in organic materials was

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A161 095 CONTINUED

AD-A161 092 12/1

investigated by the novel technique of phonon echo. The phonon echo was investigated for the d-tartaric acid and its diammonium salt as well as for the Rochelle salt by using the two-pulse technique.

DESCRIPTORS: (U) \*POLYMERS, \*POLYMERIZATION, \*MOLECULAR PROPERTIES, POLYMERIC FILMS, THIN FILMS, INTERFACES, LASER APPLICATIONS, RAMAN SPECTROSCOPY, CRYSTAL STRUCTURE, DOPING, ELECTROCHEMISTRY, MONOMERS, PHOTOCHEMICAL REACTIONS, SUBSTRATES, ELECTROLYTES, ELECTROACOUSTICS

IDENTIFIERS: (U) PEB1102F, WUAFOSR2303A3

CALIFORNIA UNIV SANTA BARBARA ALGEBRA INST

(U) Stability Analysis of Finite Difference Schemes for Hyperbolic Systems, and Problems in Applied and Computational Linear Algebra.

DESCRIPTIVE NOTE: Annual rept. 1 May 84-30 Apr 85,

AUG 85 29P

PERSONAL AUTHORS: Marcus, Marvin ; Goldberg, Moshe ;

CONTRACT NO. AFOSR-83-0150

PROJECT NO. 2304

TASK NO. A3

MONITOR: AFOSR  
TR-85-0936

UNCLASSIFIED REPORT

ABSTRACT: (U) This interim report describes the following two projects carried out under an Air Force grant during the period May 1, 1984 - April 30, 1985: (a) Stability criteria for difference approximations to hyperbolic systems, and multiplicity of matrix norms, by M. Goldberg; and (b) Problems in applied and computational linear algebra, by M. Marcus. The aim of these projects was to achieve better understanding of useful computational techniques for hyperbolic initial-boundary value problems, and to improve basic mathematical tools often used in numerical analysis and applied mathematics.

DESCRIPTORS: (U) \*FINITE DIFFERENCE THEORY, \*LINEAR ALGEBRA, BOUNDARY VALUE PROBLEMS, STABILITY, MATRICES(MATHEMATICS), NUMERICAL ANALYSIS, APPLIED MATHEMATICS, COMPUTATIONS, APPROXIMATION(MATHEMATICS), EIGENVALUES, PARTIAL DIFFERENTIAL EQUATIONS, TENSORS, OPERATORS(MATHEMATICS)

IDENTIFIERS: (U) Hyperbolic systems, Multiplicativity, PEB1102F, WUAFOSR2304A3

AD-A161 095

AD-A161 092

UNCLASSIFIED

PAGE 210 EVK551



UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A161 078

7/4

AD-A161 078 CONTINUED

MINNESOTA UNIV MINNEAPOLIS DEPT OF CHEMISTRY

IDENTIFIERS: (U) CARS(Coherent Antistoke Raman Scattering), PE81102F, WUAFOSR230381

(U) The Conference on the Dynamics of Molecular Collisions  
Held at Snowbird, Utah on 14-19 July 1985.

DESCRIPTIVE NOTE: Final rept..

JUL 85 248P

PERSONAL AUTHORS: Truhlar, Donald G. ;

CONTRACT NO. AFOSR-85-0124

PROJECT NO. 2303

TASK NO. B1

MONITOR: AFOSR  
TR-85-0930

UNCLASSIFIED REPORT

ABSTRACT: (U) The research discussed at the conference included reactive scattering studies with state selection and aligned reactants; reactive and nonreactive resonances; reactions of transition metal ions; reactive close coupling calculations and the distorted wave and quantum transition state theories of reactive scattering; potential energy surfaces; experimental studies of vibrational and rotational energy transfer collisions in the vapor and condensed phases, in ions in flow tubes, and at surfaces; collision-free energy transfer; infrared and visible fluorescence, theory and experiment for collisions of open-shell and electronically excited molecules; collisional interactions of molecules with surfaces; desorption; helium beam diffraction; and photodissociation. The plenary discussions following the lectures were exceptionally vital and provided a strong indication of the current excitement in this field. The posters covered an even broader spectrum of work on the dynamics of molecular collisions.

DESCRIPTORS: (U) \*MOLECULAR IONS, \*PARTICLE COLLISIONS, \*SCATTERING, ENERGY TRANSFER, MOLECULAR VIBRATION, OPTICAL PUMPING, DYE LASERS, RAMAN SPECTRA, RELAXATION TIME, EXCITATION, PHOTODISSOCIATION, QUANTUM THEORY, SYMPOSIA

AD-A161 078

AD-A161 078

UNCLASSIFIED

PAGE 211

EVK551

## UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

AD-A161 077 12/1

AD-A161 059 12/1

PITTSBURGH UNIV PA

PITTSBURGH UNIV PA CENTER FOR MULTIVARIATE ANALYSIS

(U) Local Error Estimated for Parametrized Nonlinear Equations.

(U) Limiting Spectral Distribution for a Class of Random Matrices.

AUG 85 8P

DESCRIPTIVE NOTE: Interim rept.,

PERSONAL AUTHORS: Fink, James P.; Rheinboldt, Werner C.;

DEC 84 27P

CONTRACT NO. AFOSR-80-0176, NSF-MCS83-09928

PERSONAL AUTHORS: Yin, Y. Q.;

PROJECT NO. 2304

REPORT NO. TR-84-50

TASK NO. A3

CONTRACT NO. F49620-85-C-0008

MONITOR: AFOSR  
TR-85-0941

PROJECT NO. 2304

TASK NO. A5

UNCLASSIFIED REPORT

MONITOR: AFOSR  
TR-85-0818SUPPLEMENTARY NOTE: Pub. in SIAM Jnl. of Numer. Anal.,  
v22 n4 p729-735 Aug 85.

UNCLASSIFIED REPORT

ABSTRACT: (U) This reprint is concerned with the development of error estimates for parametrized nonlinear equations  $F(z, \lambda) = 0$  and their discretizations  $F_h(z, \lambda) = 0$ . The estimates obtained are local error estimates in the sense of the local error in the numerical solution of ordinary differential equations. They represent a different approach to the general problem of error estimation, an approach which involves only a single discretized equation instead of a converging family of such equations. Keywords: Approximation(Mathematics); Finite element analysis; Fredholm mapping. (Author)

DESCRIPTORS: (U) \*ERROR ANALYSIS, \*NONLINEAR DIFFERENTIAL EQUATIONS, ESTIMATES, PARAMETRIC ANALYSIS, APPROXIMATION(MATHEMATICS), FINITE ELEMENT ANALYSIS, REPRINTS

IDENTIFIERS: (U) Fredholm mapping, PE81102F,  
WRAFO8R2304A3

ABSTRACT: (U) A new combinatorial technique was developed in a previous paper to prove the existence of a limiting spectral distribution. That work can be generalized in two directions. First, we can generalize to the case when  $X$  sub  $p$  has isotropic columns. This work was done in Yin and Krishnaiah and Bai, Yin, and Krishnaiah. In the second direction, we can prove the result by assuming that  $X$  sub  $p$  has i.i.d. entries with minimum moment requirements. This paper is devoted to this goal. In this paper, we have succeeded to prove the existence of limiting spectral distribution by assuming only that the second moment exists. The keys to reach this goal are (1) truncation technique and (2) sophisticated combinatorial techniques. The two-stage truncation method works in proving the main result. To prove the main result, we have to generalize the notion of  $Q$ -graph to a new kind of graphs -  $M$ -graphs. Some properties of  $M$ -graphs are developed here. In this paper, we have succeeded to prove the existence of the limiting spectral distribution in the sense of a.s. convergence. Keywords: multivariate  $F$  matrix.

DESCRIPTORS: (U) \*MATRICES(MATHEMATICS), \*MULTIVARIATE ANALYSIS, GRAPHS, DISTRIBUTION FUNCTIONS, COMBINATORIAL

AD-A161 077

AD-A161 059

UNCLASSIFIED

PAGE 212

EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY

SEARCH CONTROL NO. EVK551

AD-A161 059 CONTINUED

AD-A161 011 12/1 9/3 17/10

ANALYSIS, TRUNCATION, CONVERGENCE

MASSACHUSETTS INST OF TECH CAMBRIDGE

IDENTIFIERS: (U) \*F matrix, \*Spectral distributions,  
WUAFOSR2304A5, PE61102F

(U) The Schur Algorithm and Its Applications.

85 31P

PERSONAL AUTHORS: Yagle, Andrew E. ; Levy, Bernard C. ;

CONTRACT NO. AFOSR-82-0135

PROJECT NO. 2304

TASK NO. A1

MONITOR: AFOSR  
TR-85-0937

UNCLASSIFIED REPORT

SUPPLEMENTARY NOTE: Pub. in Acta Applicandae Mathematicae,  
v3 p255-284 1985.

ABSTRACT: (U) The Schur algorithm and its time-domain counterpart, the fast Cholesky recursions, are some efficient signal processing algorithms which are well adapted to the study of inverse scattering problems. These algorithms use a layer stripping approach to reconstruct a lossless scattering medium described by symmetric two-component wave equations while the interaction of right and left propagating waves. In this reprint, the Schur and fast Cholesky recursions are presented and are used to study several inverse problems such as the reconstruction of nonuniform lossless transmission lines, the inverse problems for a layered acoustic medium, and the linear least-squares estimation of stationary stochastic processes. The inverse scattering problem for two-component wave equations corresponding to lossy media is also examined and solved by using two coupled sets of Schur recursions. This procedure is then applied to the inverse problem for lossy transmission lines. (Author)

DESCRIPTORS: (U) \*INVERSE SCATTERING, \*SIGNAL PROCESSING, \*SEISMIC DATA, WAVE EQUATIONS, MATRICES(MATHEMATICS), MATHEMATICAL FILTERS, SCHRÖDINGER EQUATION, STOCHASTIC PROCESSES, LEAST SQUARES METHOD, REPRINTS

IDENTIFIERS: (U) Schur algorithm, Fast Cholesky

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PAGE 213 EVK551

UNCLASSIFIED

DTIC REPORT BIBLIOGRAPHY SEARCH CONTROL NO. EVK551

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AD-A161 011

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PAGE 214

EVK551

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